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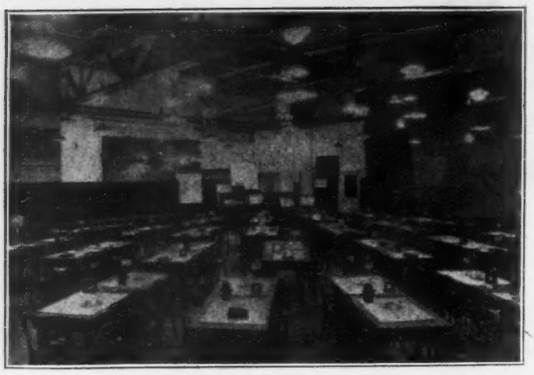
Demonstrating Industrial Lighting

Description of Exhibition Rooms in Cleveland and at Convention of Ohio Electric Light Association — Commonwealth Edison Co. Compares Proper and Improper Factory Lighting

Description and discussion alone cannot convey a full understanding and appreciation of the new standards in industrial illumination. Its attributes and potentialities must be made known through demonstration. Good lighting must be seen, felt and experienced; it should be contrasted directly with conditions of the kind that still prevail generally. With such assistance, the central-station representative soon comes to understand the elements of proper factory illumination and realizes the enormous opportunity he has to serve industry while at the same time multiplying several times the revenue from this load. By demonstration, also, the associated electrical interests of a given community can acquire the common understanding of the subject necessary to undertake a program through which the consumer will be adequately served with equipments of the proper kind properly installed, and thus remove the limitations on the amount of light which the factory can profitably employ. And, finally, a demonstration forms, by all odds, the most effective of all lighting sales methods. It offers the opportunity of arousing the interest and of educating not only officials of individual plants, but also entire engineering, trade and business organizations.

The demonstrations that have been presented at recent conventions have been based upon one developed during the past year to present the new standards in industrial lighting, show how they have come about and what they mean to

Interior of Industrial Lighting Demonstration Room at the Ohio Electric Light Association Convention.



Interior of Demonstration Room Developed at Nela Park.

industry before a large group of people. It was desired to show that, with popular instruments of measurement in use, factory lighting has become a definite quantitative art; that the requirements can be analyzed readily and met easily with modern standardized equipments, and that there are actually vast apparent differences between the old methods and the new standards. The demonstration appeared to be effective, and requests for its repetition came from many sources. It was made under conditions representative of those to be found in many other locations and is described here to furnish such suggestions as it may for installations in other cities.

Description of Room Used for Demonstration Purposes.

The installation was made in a section of a building erected for garage purposes, but used temporarily as a factory cafeteria. The room is 50 ft. wide with open steel trusses, has a total ceiling height of 17 ft. and a clear height under the trusses of 14 ft. These trusses divide the room into 16-ft. bays, three of which were curtained off with gray canvas and forming a room substantially 50 ft. square for the demonstration. The walls and ceiling were of a medium color.

A general view of the demonstration room is shown in one of the accompanying illustrations. Another illustration shows a portion of the interior of a similar demonstration room arranged and used at the recent convention of the Ohio Electric Light Association. However, this room was only 30 ft. square, but served quite well to illustrate the methods of display and to show the relative merits of the various lighting arrangements.

Details of the General Lighting Systems Demonstrated and Compared.

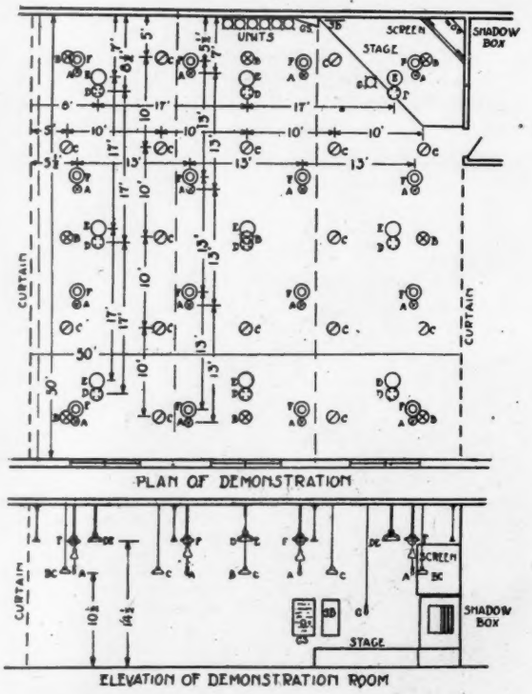
Types of lamps and reflectors used, height of suspension and other details of the various lighting arrangements are shown in the accompanying dimensioned sketch. The original installation, providing for the use of the space as a factory cafeteria, consisted of three bowl-frosted lamps in shallow-dome reflectors at the centers of the bays. The three overhead units were supplemented with a number of drop lamps, both large and small, with and without reflectors, to simulate more nearly conditions as found in a large percentage of factory interiors at present.

System "A" is made up of sixteen 100-watt clear lamps with deep-bowl reflectors, the reflectors being attached to cords so that they can be pulled up away from or lowered over the lamps. These units are spaced on 13-ft. centers and are mounted 10 ft. 6 ins. above the floor level. This arrangement of units gives average illumination intensities on the table tops of 2.9 foot-candles with bare lamps and 4.1 foot-candles with the reflector in place. The variation in illumination ranges from 3 to 6 foot-candles when the reflectors are used.

System "B" is of slightly higher wattage than system "A," there being nine 200-watt bowl-enameled lamps installed in RLM standard dome reflectors. These units are spaced on 20-ft. centers and are suspended 10 ft. 6 ins. above the floor. The illumination obtained averages 5.5 foot-candles with a variation of from 1.9 to 11 foot-candles.

System "C" is made up of sixteen 200-watt bowl-enameled lamps in RLM standard dome reflectors. Systems "B" and "C" taken together comprise a total of twenty-five 200-watt lamps suspended in reflectors at a height of 10 ft. 6 ins., and with the units spaced on 10-ft. centers. This combined system gives an average illumination of 15 foot-candles, with a range of from 14 to 16 foot-candles at different points around the room.

System "D" includes a total of nine 200-watt



ELECTRICAL INSTALLATION

CIRCUIT	NUMBER UNITS	LAMPS	REFLECTORS	SPACING	HEIGHT	REMARKS
⊕ A	16	100-w CI	Deep bowl	13 x 13'	10½'	Reflectors on cords
⊗ B	9	200-w. B.E	RLM dome	20' x 20'	10½'	
⊘ C	16	200-w B.E	RLM dome	10' x 10'	10½'	Supplements Circuit B
○ D	9	200-w. B.E	Glass-top dome	17 x 17	14½	
○ E	9	500-w CI	RLM dome	17 x 17	14½'	Opal glass caps on lamps
ⓕ F	16	500-w C2	Glass enclosing	13 x 13	14½	Daylight lamps in one-piece diffusing and reflecting units
	C	1	300-w CI	None	As shown	7 On cord. To show glare
	GS	1	500-w AF	None	As shown	Behind glare sign
	SB	Switchboard for control of all circuits				

Sketch Showng Arrangement of Demonstration Room at Nela Park.

bowl-enameled lamps in dome reflectors with glass tops. The spacing in this system is 17 ft. and the suspension height is 14 ft. 6 ins. The total range of illumination is from 4 to 6 foot-candles, and the average illumination is 4.9 foot-candles. Opaque cones, attached to cords, may be added to the units of this system to show the actual effect of the glass-top portion of the reflector.

System "E" is made up of nine 500-watt bowl-enameled lamps suspended 14 ft. 6 ins. above the floor in RLM standard dome reflectors. The spacing in this system is 17 ft. and the average illumination is 14 foot-candles.

System "F" comprises sixteen 500-watt type C-2 lamps in 20-in., one-piece diffusing and reflecting glass inclosing units. The height of suspension is 14 ft. 6 ins., and the spacing is on 13-ft. centers. An average illumination of 11.5 foot-candles is obtained with this system.

In considering these various systems and the results obtained, it should be borne in mind that the equipment was all new and that allowance should be made for certain depreciation in service.

Platform Apparatus for Presenting Various Lighting Effects.

A small platform was erected in one corner of the room and the control of all lighting units brought to a switchboard at this point. A rheostat in the main circuit permitted reduction of the voltage of the various systems to at least 15 volts below normal. At the back of the platform was a large box lined with black velvet and open at the front, in which were three vertical wooden bars of different cross-sections, and lighting circuits providing illumination from any or all directions. A screen for the projection of lantern slides was placed above this box. In the roof truss, above and to the front of the stage, was mounted a 250-watt floodlight with its beam directed to the stage. A rheostat was placed in series with this lamp so that the intensity of illumination on the stage could be varied at will.

A large card in the form of a Snellen chart, so modified as to reduce the gradation in size between rows of letters, was available for mounting on an easel. In addition, there was provided a device for exposing a desired letter or group of letters for a short period.

At one side of the stage was a row of lamps with clear bulbs, diffusing bulbs, diffusing globes, etc., for use in analyzing glare. Below these was placed a chart with lettering of various sizes and a translucent center spot, behind which was placed a 300-watt lamp connected with a rheostat.

Large charts showing plan views of the room, the different systems of lighting, and indicating the position of the various tables, were available in discussing the results obtained. A blackboard completed the platform equipment.

On the tables at which the audience sat were placed foot-candle meters for measuring the illumination, bright tinned pans and lids for observing reflected images of light sources, and castings of such complication as to indicate the shadow conditions.

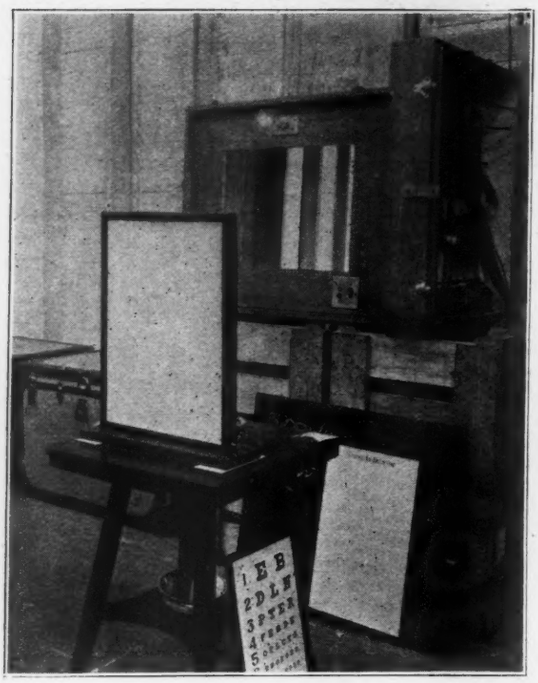
Visual acuity may be demonstrated by the use of the modified Snellen chart. By illuminating the chart to an intensity of 1.5 to 2 foot-candles, and then to 12 or 15 foot-candles, it is found that an additional line or two can be read from any point in the room with the higher illumination.

The time element in vision may be illustrated by means of the apparatus for exposing letters or other characters for measured short intervals. Letters that cannot be identified, when exposed for a given time with an illumination of 1.5 to 2 foot-candles, are easily distinguished when subjected to an intensity of 12 to 15 foot-candles. This demonstration, together with the demonstration of visual acuity, show conclusively that adequate lighting permits the observer to see more and to see quicker than when inadequate lighting is provided.

Demonstration Room Inclosed With Cloth Walls.

Direction of light has a definite effect on vision, as may be demonstrated by the use of the shadow box shown prominently in the illustration of the equipment used at the Ohio Electric Light Association convention. When the three wooden bars in the shadow box are illuminated from four sides, their appearance is substantially identical. With light largely directed from one side, however, they stand out distinctly as of round, triangular and square cross-section. Thus is shown the importance of differences in brightness, that is, light and shade, in revealing the form of objects.

Glare and its effect on the accuracy of vision is demonstrated by means of the glare chart already mentioned. With increasing voltage on the lamp behind the glare chart the smaller letters near the bright spot became obliterated, evidencing the truth of the statement carried on the chart, "A bright light near the line of vision greatly reduces one's ability to see detail." As the brightness is further increased the chart can be viewed only with discomfort. Thus the effects of glare, both in interfering with vision and in causing discomfort, are emphasized. The row of units above the chart is used to show the



Apparatus for Demonstrating Visual Acuity, Value of Shadows, Etc.

effects of brightness and total quantity of light in causing glare. The effect of the position of the light source with respect to the eye may be indicated by raising and lowering a bare lamp above the platform.

Glare from unshaded light sources is illustrated by the bare lamps of the original system and system "A," contrasted with the results when the reflectors are lowered over the lamps. Reflected glare from bright surface is apparent in the tinned pans. The value of the bowl-enameled lamp and the inclosed diffusing unit in minimizing the effects of images of the units can be clearly demonstrated. The effect of contrast between the lighting units and the background may be studied by comparing the results under systems "A" or "BC" with those of systems "D" and "F," which transmit light for the illumination of the ceiling.

Color of light is shown to have definite effects on the quality of vision by experimentation with system "F," employing the so-called daylight lamps. Various colors are better identified under the whiter light, and better effects are produced when the white light is mixed with daylight by opening doors or window shutters.

Discussion of Results Observed During the Demonstration.

Data already given for the conditions as described for system "A" show that reflectors actually increase the amount of light on the tables located at various places in the demonstration room. Non-uniformity resulting from too wide spacing of units for a given mounting height is indicated by system "B," where the illumination directly under the units is found to be six times that midway between lamps. Substantially uniform illumination is obtained by the same number of units mounted higher in system "D," whereas the combination of systems "B" and "C" gives a sufficiently close spacing to obtain uniformity at the lower mounting height.

The value of soft luminous shadows is illustrated by comparing the sharp deep shadows produced with the clear lamps in small reflectors, system "A," or by an insufficient number of units, system "C," with the improved results under systems "BC," "D," "E" and "F," where most of the light is redirected from larger reflector surfaces with, in some cases, a considerable amount from the ceiling and walls. The general impression produced by different types of lighting installations may be noted in comparing the dark ceilings and walls characteristic with the deep bowl reflectors, the better illumination of side walls with dome reflectors, the improved illumination of ceilings as well as walls with the glass-top dome reflectors, and the attractive appearance of ceilings, walls and the units themselves when the glass inclosing units are employed in system "F."

By means of the rheostat in the main circuit, the voltage of the lamps may be reduced by varying amounts to indicate the effect on light output. The foot-candle meters will show directly the great decreases in illumination with voltage reductions much below normal.

Proving the Theory of "Too Much Light" Is a Fallacy.

The popular fallacy of "too much light" may be shown to result from the use of improper units which cause excessive glare. All the lighting systems can be turned on simultaneously, giving an intensity of about 50 foot-candles, revealing all details of objects perfectly and with entire comfort to the audience. This intensity, when compared with the much higher intensities which prevail near windows and outofdoors under good daylight conditions, shows that the present new standards, although much higher than those of the past, are far below anything that might be called "too much light."

Considerations in Selection of a Demonstration Room.

A room about 50 ft. square, with a 15-ft. or somewhat higher ceiling, is of ideal size for an industrial-lighting demonstration. If the room has the general appearance of a factory interior,

Model Factory Room Where Six Types of Modern Industrial Lighting Are Shown by Commonwealth Edison Co., Chicago.

and tables or benches can be provided at which the audience can be seated, its use is rendered most effective. A high ceiling is valuable in showing the important relation between mounting height and spacing distance. A satisfactory demonstration may, however, be made in a room which is somewhat smaller; it is desirable that the width be at least 30 ft., and the length preferably greater, so that three rows of units may be

Improperly Lighted Workroom Displayed by Commonwealth Edison Co., Chicago.

installed. It is not possible to represent the lighting effects which would actually result in typical manufacturing interior in a room so small that only a few units can be installed.

Many central-station companies have rooms which could readily be adapted to this purpose, and at the same time continue to serve for uses of a character with which demonstrations will not seriously interfere. Such rooms may be in use as meter-testing laboratories, garages, reserve power plants, etc. In some cities the associated electrical interests may find it desirable to utilize a vacant store room, factory loft, or the like. The Commonwealth Edison Co., Chicago, has recently fitted up an effective installation in a part of the main floor of its general office building. Machine tools, benches, racks, etc., make the conditions typical of the shop, and the demonstration is most convincing. The location has the advantage of accessibility.

SOME FACTS ABOUT WATER HEATING WITH ELECTRICITY.

Electric Water-Heater Idea the Foundation for Some Stock Promotion in Which Glowing Claims Prove Misleading.

By H. Bobker.

Scheming promotors have used the electric water-heater idea as a bait to extract money from the public. They generally used in their appeals ambiguous statements, including such catchy phrases as "lamp-socket device," "oceans of boiling water free" and the like.

Every electrician and engineer knows that the amount of heat to be generated from any electric circuit depends upon the amount of energy flowing in the circuit. Efficiency of electric heating units is measured by the maximum amount of heat obtained from the minimum consumption of electricity.

The principle of the faucet type of electric water heater involves the flowing of a stream of water through the pipe to which the heater is attached and, when hot water is desired, the turning on of the electricity by means of a switch, or in some cases, by the handle of the faucet which also operates the switch. As an example there is the non-portable type which screws onto the pipe in place of the ordinary faucet. The handle of this type has three positions, upright for "off," to the right for "hot," and to the left for "cold." The faucet handle operates in unison with the switch so that when hot water is desired the turning of the handle to the right performs the dual operation of allowing the water to pass over the resistance element and out through the faucet; at the same time turning the switch to the "on" position allows the water to bypass the resistance element and flow direct from the pipe to the outlet. The bypass is important because the resistance element cannot last very long if the cold water is permitted to pass over the hot wires.

Considering the lamp-socket device in relation to heating water it is found that the maximum capacity allowable for a lamp socket is 660 watts, or 6.6 amperes at 110 volts. A kilowatt-hour of energy contains 3412 B.t.u., and 1 B.t.u. of heat will raise 1 lb. of water 1 deg. F. Assuming that the water is supplied to the device at a temperature of 50 deg. F., and it is desired to raise it to 210 deg., the temperature of the water must be raised 160 deg. To raise 1 lb. of water (equal to 0.1 gallon) to the desired temperature requires 160 B.t.u.; thus one whole gallon of water requires 1600 B.t.u. Therefore, with the maximum of the lamp socket at 38 B.t.u. it will raise the water 160 deg. in a quantity of less than one-fifth of a pint, the supply getting down to a mere dribble.

There is no kind of heating element in existence that can extract more heat from an electric circuit than it contains. Any assertion to the contrary is intended to deceive for the purpose of illegal gain.

FARMERS COMBAT GYPSY MOTHS WITH VACUUM CLEANERS.

An electrical dealer at Lakeville, Vermont, sold a vacuum cleaner to a woman who suffered considerable damage as a result of the invasion of the Green Mountain country by the gypsy moths a year ago. Despite several weeks of constant effort on her part picking the pests off her trees and arbors by hand, and then immersing them in gasoline, she was unable to keep up with their inroads and lost most of her fruit crop.

During the past winter she devoted all her spare time searching for a more effective cure for the moths and finally decided to try electrical methods. Long lines of wires were installed in her orchard and a vacuum cleaner purchased. As a result when the pests returned this summer she attacked their nests, applying the cleaner to the trees and shrubs. Her experiment has proven such a success that several other farmers about Lakeville are installing electric vacuum cleaners for the same purpose.

Automatic Substations for Street-Lighting Service

Present Developments in Street-Lighting Design and Operation in City of Milwaukee — Extracts from Paper Before Western Society of Engineers and Illuminating Engineering Society

By F. A. VAUGHN

Consulting and Illuminating Engineer, City of Milwaukee.

Briefly the new street-lighting system of the city of Milwaukee may be described as being of the constant-potential series type. The city is divided into a certain number of approximately rectangular areas, each area containing a complete street-lighting circuit divided into two or more sub-circuits or series-loops. Usually, at a point about which four or more of these rectangular areas cluster, a substation is located, through which these series street-lighting circuits are connected to the ordinary 2300-volt constant-potential 60-cycle feeders of the public utility company's regular commercial a-c. system. Multiple transformers are utilized for this connection between the series circuits and the constant-potential feeder, adjustment of voltages being made by means of the taps on the primaries and secondaries of the transformers.

At these substations are installed the necessary time-switches for lighting and extinguishing the circuits, the time-limit overload relays, the oil circuit-breakers for protection of the various metering devices, the testing connections and other paraphernalia shown in the illustrations. The

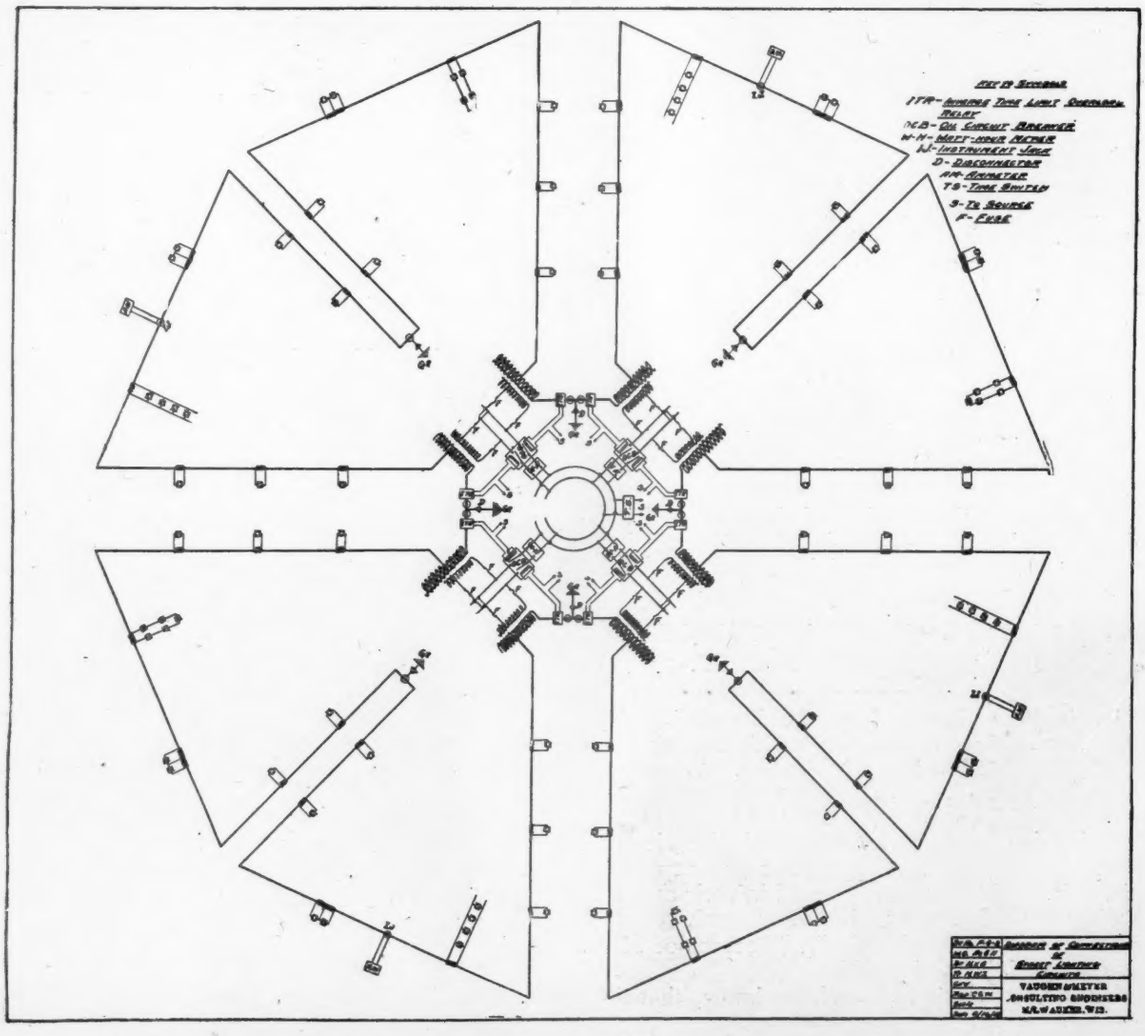


Fig. 1.—Diagram Showing Connections of Street-Lighting Circuits in the City of Milwaukee.

typical series circuit may contain various sizes of lamps in single, double and multiple styles of units, all supplied with constant current from the secondaries of series-multiple transformers placed in the ground at or near the bases of the concrete lamp post.

Fig. 1 indicates schematically how these units may vary from single-lamp units of any desired candlepower to double-bracket units supplied by two-coil transformers with common return or how several units may be connected in a group fed by a "safety-coil" or group transformer. Circuits may be divided into as many sections as is desired by increasing the number of small transformers and grounding midway between each pair of main transformers. This makes it feasible to operate the circuits in a group with only a comparatively small area "out," the particular loop which is open-circuited being bypassed through the ground at the station and the ground at the center of the loop. With this arrangement one-half of any given loop will comprise the maximum number of lamps "out" due to any single case of open-circuiting. The apparatus indicated in the central portion of the diagram consists of primary transformers, oil circuit-breakers, overload relays, time-switches, disconnecting potheads and such apparatus as originally was included in the substation, and represents what is actually known in this system as a substation.

There are a number of these substations in various parts of the city, each of which controls a number of circuits as indicated by the diagram. Substations have been designed and developed in three forms to meet the requirements of the various places available for installation. The three designs include overhead, underground and indoor types, the indoor stations being suitable for installation in school houses, fire stations and other public buildings.

Fig. 2 shows the first overhead substation

Fig. 2.—First Overhead Street-Lighting Substation Installed in Milwaukee.

which was hurriedly installed in April, 1915, for the purpose of controlling the entire original demonstration installation. This original station is still operating satisfactorily. The permanent overhead substations, one of which is shown in

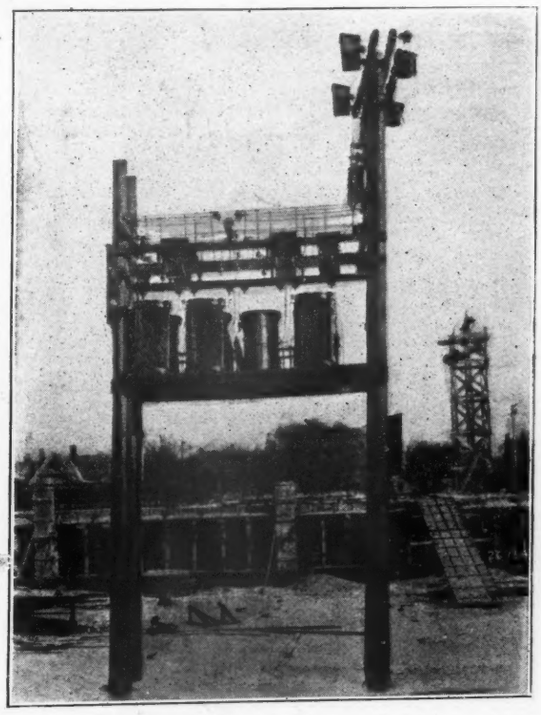


Fig. 3.—Present Standard Type of Overhead Street-Lighting Substation.

Fig. 3, present a neater appearance and are more complete in design and more permanent in construction, but of the same general type as the original station.

Since the conventional type of street-lighting substation controlling a section of this character would contain some type of movable-coil regulator, attention is called to the fact that nothing of this nature exists in this substation. The transformer utilized was actually not designed as an automatic regulator for the circuit, but as an effi-

TABLE SHOWING VOLTAGES DERIVED FROM VARIOUS SECONDARY TAPS ON THE MULTIPLE TRANSFORMERS.

Terminals Used.	16.5 Kv-a. Transformers. Volts.	10.25 Kv-a. Transformers. Volts.	4.125 Kv-a. Transformers. Volts.
8 and 9.....	1,965	1,220	380
8 and 10.....	2,005	1,245	460
8 and 11.....	2,040	1,270	475
8 and 12.....	2,085	1,295	490
8 and 13.....	2,125	1,320	505
8 and 14.....	2,170	1,345	520
8 and 15.....	2,215	1,370	535
8 and 16.....	2,260	1,400	550
8 and 17.....	2,305	1,430	565
8 and 18.....	2,350	1,460	580
8 and 19.....	2,400	1,490	595
8 and 20.....	2,450	1,520	610
8 and 21.....	2,500	1,550	625

cient means of transformation to the voltage required by the series secondary circuit, which voltage is dependent upon the number and wattage of the street-lighting units connected in series. Its main feature is the multiplicity of taps on the primary and secondary coils providing for the manual adjustment of the average

ratio of transformation to accommodate any transformer to the voltage required by the series secondary circuit. There are six taps on the primary coil and thirteen taps on the secondary coil of each transformer, the primary taps covering

Fig. 4.—Series-Circuit Testing Station Installed in Abandoned Fire-Alarm-Box Pedestal.

a range of from 2000 to 2375 volts. Secondary taps have voltage ratings of 380 to 625 volts for the 4.125 kv-a. transformer, 1220 to 1550 volts for the 10.25 kv-a. transformer and 1965 to 2500 volts for the 16.5 kv-a. transformer.

While every effort was made to design a high-grade, efficient transformer, the details of design do not possess sufficient novelty to make their description interesting. It is sufficient to note that these transformers do not perform the usual regulation functions expected of primary street-lighting transformers in the ordinary practice.

Certain other small pieces of apparatus such as time-switches, recording meters, relays, cut-outs, etc., are installed in connection with the substations. The time-limit overload relay is undoubtedly, the most interesting of these various pieces of equipment. The relays in use have been quite successful in protecting the circuits against wholesale burnouts due to grounding. It may be stated that the loss of lamps through this cause is practically nil. The induction-type relay used gives very satisfactory range of inverse-time and current adjustment. This adjustment has been checked periodically and has been found to remain constant.

In case short-circuits or grounds do occur on the cable the trouble can be located quickly through inspections and the use of exploring-coil type of test sets and other instruments which can be inserted into the circuit at various points. A special test station arranged for the easy connecting of the desired instruments is shown in Fig. 4.

The almost entire absence of trouble thus far has made the outages on this system practically negligible. Individual lamp burnouts, as can be seen by the schematic diagram, Fig. 1, do not, of course, affect the rest of the system or circuit, unless there should be an unusually large number of lamps burn out in one series. The circuit is self-regulating to such a degree as not to affect the illumination under any reasonable conditions, and as more and more lamps burn out the lamp filament current gradually reduces, so that, under extreme conditions, the circuit is self-protecting and the lamps are not subjected to excessive current. The illumination, of course, drops in accordance with the characteristics of the filament of the gas-filled tungsten lamp.

In order to anticipate the possibility that a change in the desired intensity of illumination on any given street might be desired, because of increased traffic or change of type of business or buildings on the street, the series-multiple lamp transformers for this system were designed with a view to making their overload and underload characteristics rigidly conform to good practice under such anticipatory conditions. Therefore, size 1 transformer was so designed that its 100% point falls between the load of a 100-candlepower lamp and that of two 80-candlepower lamps in series. It, however, was also designed to operate with the next larger sized lamp in the system, namely, 250 candlepower. Size 2 transformer was built for both the 250-candlepower and the 400-candlepower 6.6-ampere lamp. Size 3 was designed for the 400-candlepower and the 600-candlepower 6.6-ampere lamp. Size 10 was designed for the 600-candlepower and the 1000-candlepower 20-ampere lamp, and size 20 was designed for the 1000-candlepower 20-ampere lamp with an overload range up to the equivalent of a 1700-candlepower 20-ampere lamp.

When using the size larger lamp than the transformer is normally rated for, and allowing

Fig. 5.—Substation Equipment Installed in School Building.

these lamps to vary in their individual wattage-consuming characteristics over a range of 80 to 110% of normal, the regulation of the size 2 transformer will be within 1.14%. From curves

illustrating the magnetic characteristics of the three smaller sizes of transformers, it may be found that the flux densities are approximately 50 kilolines per sq. in. at 140% rated load. The actual secondary current under this condition is 6.53664 instead of 6.6 amperes. This is the current that will actually flow through the filament of the 400-candlepower lamp when used with the 250-candlepower transformer.

The care and attention given to the design and construction of these series-multiple transformers was justified, for the resultant circuit operating characteristics are very satisfactory. The whole object of the development was to secure a performance from the gas-filled tungsten-filament incandescent lamp that will give the desired illumination on the streets and will maintain it at high efficiency as dependably as possible under all normal operating conditions.

The system utilizes the gas-filled tungsten-filament incandescent street lamps in sizes from 100 to 1000 candlepower, some of the sizes being rated at 6.6 amperes and others at 20 amperes. These lamps are in no way specially designed for this system, but are a standard street-lighting series type with no special or exceptional specification requirements. It was thought that a system should be so designed and operated that the ordinary types of lamps, with comparatively wide variations in characteristics, could be utilized with considerable resultant economy.

TABLE SHOWING AVERAGE LAMP LIFE FOR ABOUT 75 LAMPS OF EACH SIZE.

Size	Life
100 candlepower	2,600 hours
250 candlepower	3,800 hours
400 candlepower	2,380 hours
600 candlepower	1,800 hours
1,000 candlepower	2,680 hours

If the current in these lamps can be maintained reasonably constant, the illumination of the streets will remain satisfactory as to continuity, uniformity of distribution and intensity, and the operation of the system from the standpoint of illumination and cost will be satisfactory. These results have been realized in this system to a most encouraging degree. The chart shown in Fig. 6 illustrates the degree of uniformity to which the primary voltage is regulated at the feeding side of the substations. It will be noted that this chart covers a period from the early evening to midnight while there are considerable variations in the general load on the supply system.

Actual results are reflected, of course, in the average lamp life and number of burnouts on the system. The lamp record, in card-file form, is kept as illustrated in Fig. 7. While this record illustrates the lamp life on a single circuit, the accompanying table gives some idea of the average lamp life secured. These are records of lamp life to burn out, and are given as evidence of good overall regulation on this system as a whole. These results, it is believed, fully meet the anticipations of the designing engineers as well as the public, and these ideas have, therefore, been adopted and incorporated in the system, which is now about 40% completed.

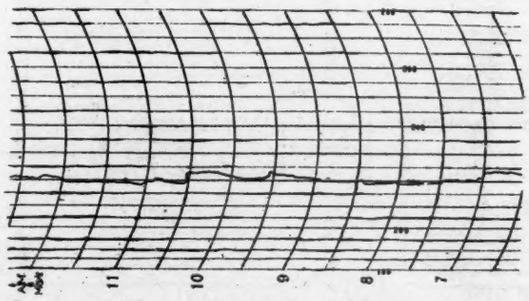


Fig. 6.—Recording-Voltmeter Chart Showing Uniformity of Supply Voltage.

LAMP RECORD

TYPE 22½ Single Bracket C. P. 400 UNIT NO. Z1418

LOCATION 12th St. E.S. - 407 N. of Galena St.

MAKE	PURCHASED	INSTALLED	REMOVED	LIFE	FAIL			REMARKS
W		2-15-16	2-15-17	3953	E			A = Regular
W	12-30-16	2-16-17	9-27-17	2087	A			Burn out
W	12-30-16	9-29-17	10-21-17	269	A			
W	1-2-17	10-23-17	5-18-18	1916	A			E = Deteriorated
W	12-30-16	5-20-18	11-9-18	2237	A			Filament
W		11-11-18	8-29-19	3089	E			
W	9-10-18	8-29-19						

Fig. 7.—Lamp-Record Card and Record of Lamp Operation.

PLAN HYDROELECTRIC DEVELOPMENT IN INDIA.

Need of Additional Power for Operation of Gold Fields May Result in Increased Installation of Equipment.

Reports recently received from Mysore State, India, indicate that some large hydroelectric development will be made in that state in the near future to provide additional power for the operation of several large gold fields in that territory. The territory involved lies near the Cauvery river and a hydroelectric installation on that river has been in operation for several years supplying light and power to the Kolar gold fields and the cities of Bangalore and Mysore.

Despite additions made to this installation at several times there is a power shortage in the section, the Kolar gold fields and Bangalore, in particular, seeking a large increase in supply at this time. The storage of the waters of the Cauvery river by means of the Krishnarajasagara dam assures the necessary supply of water to meet this increased demand up to 25,000 hp., or 2500 hp. more than the present capacity of the plant.

A recent order of the Indian government gives authority to the chief electrical engineer to place an additional installation at Sivasamudram in order to meet the increased demand for power, while much of the machinery in the older installations will be scrapped and replaced with new equipment.

There are several schemes before the Indian government for much larger utilization of the waters of the Cauvery river. There are, in addition to the present site at Sivasamudram, two sites where power stations can be installed in the Cauvery valley, one at the Shimsha Falls and the other at the Mekadatu Falls. The possibilities

of the falls at Shimsha are said to be great as the drop is at least 1.6 times that of Sivasamuddram, from which they are distant about 4 mi. It is planned to build a power station at Shimsha Falls. In addition to the natural flow in the river there will be a considerable additional flow due to leakage from a new irrigation project under the high level channel from Kanambadi. This flow, which would otherwise go to waste, can be utilized in connection with the Shimsha Falls.

The second scheme is of smaller scope. Investigations show that at the Mekadatu Falls, about 4 mi. below the Arkavati junction, a net head of about 140 ft. will be available and that from this head about 8000 hp. can be generated. It is pointed out that by using the Mekadatu Falls site the same water could be used twice, as the Shimsha Falls is below their location and would get the same water after it had gone through the Mekadatu plant. It is estimated that about 100,000 hp. can be developed if the present plans are fully carried out.

NEW ADVERTISING SERIES STARTED BY WESTERN ELECTRIC CO.

Results of Pioneer Movement in Editorial Advertising so Satisfactory to Company That Second Series Results.

"For Better Public Relations" is the apt title given a pamphlet sent out by the Western Electric Co., 195 Broadway, New York City, announcing its second series of editorial advertising, consisting of ten advertisements that the company intends to publish in the interests of the electrical industry and the public utilities.

Six months ago the company started its first series of this sort of advertising, and in a foreword to the new pamphlet, entitled "What We Have Learned in Six Months," President Charles G. DuBois of the company tells of the hearty indorsement the campaign received.

The advertisements are designed as an aid to all lines of the industry and will be published in magazines of national circulation during the last six months of the current year, one of the advertisements in each line treated having appeared in July issues of 11 different magazines.

The subject of the advertisements and the branch of the electrical industry that they are aimed to benefit are as follows: No. 11, "Hydro-Electric," central-station companies; No. 12, "Public Be Jammed," street-railway companies; No. 13, "A Saving You Can't Afford," architects and engineers; No. 14, "To Answer Your Ad," contractor-dealers; No. 15, "Cause-Starvation," street-railway companies; No. 16, "While the Case Is Argued," central-station companies; No. 17, "Crack o' Doom," central-station companies; No. 18, "Look What's Happening," telephone and central-station companies; No. 19, "Mr. Aesop Gets a Shock," central-station companies, and No. 20, "Stalled," steam railroad companies.

The make-up of each ad is similar, consisting of an illustration at the top pertinent to the subject and followed by comment on whatever particular branch of the industry the advertisement refers to, told simply, plainly and direct to the point, and in a way to hold the attention of the layman reader.

"We've come to answer your ad"
There are days when servants have become so rare that housewives speak of them in hushed tones as "jewels" and "perfect treasures."
For scrub-ladies and wash-ladies, alas! we sigh in vain.
But electricity has come in time to lighten the labors and brighten the leisure of home. Electrical washing machines, irons, dishwashers, vacuum cleaners, sewing machines—all ready to put in a twenty-four hour day. Whether our house is old or new, we can have it wired for these modern conveniences.
But it's a natural question to ask, "How can the electrician get all those wires through the walls without putting us out of house and home while he's doing it?"
Just watch him dexterously pass a wire down behind the wall and "fish" it out on the floor below. Or see with what ease he wires a fixture by taking up a board in the flooring above and reaching down.
Mindful of the householder's care for his furnishings, the electrical contractor works in neat and orderly fashion, protecting woodwork, furniture and plaster as he goes, without interruption to the use of the rooms.
So while he is at it, let the contractor work out his plans for ample circuits. Indeed, the more fixtures and sockets and baseboard outlets, the more opportunities does he give electricity to prove itself the all-around aid we have been longing for.
In plan and installation the contractor's experience is a sure guide to that "Well, we're glad we had the electricity put in" feeling.
Published to the interest of Electrical Development by an Institution that will be helped by whatever helps the Industry.
Western Electric Company
No. 14. Don't think only of Western Electric as a name on your vacuum cleaner or iron, but also as an organization which serves to serve lighting, in safe and rapid transit, its communication to store or window—and to every other field of electrical endeavor.
COAL
There was once a substance called coal
It doesn't take a Jules Verne to imagine the time when our present-day fuel will be gone.
But there is nothing frightful in the prospect. Already the world's engineering brains have cast ahead and discovered a new fuel in rain drops and dew fall—water power.
Nor is this source of power a hazy dream of the future. It's here.
In California, for example, 942,000 hydro-electric horsepower are right now turning wheels, lighting cities and harvesting crops.
In the United States as a whole there are 9,000,000 hydro-electric horsepower actually at work—and this is but fifteen per cent of our available supply.
It is to the other eighty-five per cent we must look against the day when coal and oil are museum curiosities.
Just how soon hydro-electric development will come to any community must depend on local conditions—such as how long the coal supply there can advantageously compete with water power.
But in the many places where coal is scarcely to be had, sane common-sense thinking about the relative economy of water power will hasten its coming—to the common good.
We should all understand that water power is not the interest of any particular business—that it is not a political issue, but a great economic one which affects us all.
So its support must come from the people, whose money will be needed to finance it. And rightly so.
Conservation of our national resources is one of the first benefits of water power development. The preservation of forests, the avoidance of floods, the irrigation of arid lands are part and parcel of this program.
Truly, unharnessed water is a national possession which goes to waste as long as we do not use it—and in this day of inadequate production and the high cost of living, any waste is an economic crime.
Published in the interest of Electrical Development by an Institution that will be helped by whatever helps the Industry.
Western Electric Company
No. 11 The Western Electric brands in one city is one of more than forty similar organizations distributing electrical products of all kinds, through retailers to the general public and direct to industrial users. Western Electric service is within your reach wherever you may be situated.
Mr. Aesop gets a shock
The genial fable-maker of Greece pointed many a moral against self-interest. But what seemed to him an evil, today we place in the column of virtues. Shocking indeed to Aesop!
Events have been happening in the electric light and power industry to prove that self-interest in each of us can benefit our neighbors as much as ourselves. And thereby hangs a tale—
There is a certain broad valley in this land where till recently business was poorer than a church mouse, and the cost of living higher than folks liked to think about. Therefore some merchants and artisans and farmers met to find the remedy.
Said a farmer, "If the electric power plant only reached out my way, I could irrigate a hundred acres more."
"Then I'd build you a new barn," a carpenter replied.
Said a real estate man, "I've fifty building lots nobody will buy, because I can't get electricity there."
"Think of all the furnishings I might sell to fifty homes," sighed a department store man.
Electric light and power! That was the need. The Electric Company couldn't furnish half enough. It hadn't the money to extend its service. Rates were low. Investors wouldn't invest.
So these business men asked the public service commission to grant the Company a higher rate.
The commission raised the rate. That made the Electric Company a safer investment, and people began to buy its bonds. With the added resources the Company built a bigger service. Homes sprang up along the lines. Everybody's sales increased. Factories and farms, with ample power to produce larger quantities, sold with profit at lower prices.
Moral: Perhaps in your own community the Electric Company is hampered by a lack of funds. Then, to invest in the Company's bonds or to pay a little more on your electric bill may be the surest way to boost your own business—and boost your town as well.
Published in the interest of Electrical Development by an Institution that will be helped by whatever helps the Industry.
Western Electric Company
No. 19 Reaching into every corner of this broad land, even to the most secluded farm, the Western Electric organization brings all the conveniences and the utility of electric light, power and communication.

Facsimilies of Advertisements Now Being Used in a Campaign by the Western Electric Co. for the Benefit of Entire Electrical Industry.

Problems in Ornamental Street Lighting

General Scheme of Illumination of Relatively High Intensity Is Best for Municipalities—Conduit and Parkway Systems of Wiring—Glare Must Be Avoided in Proper Lighting of Streets

By L. A. S. WOOD

Manager, Illuminating Section, Westinghouse Electric & Manufacturing Co.

The term "white way" has been used extensively in connection with ornamental street lighting and has been the cause of considerable misapprehension on the part of the public as to the purpose of ornamental street lighting.

An ornamental street lighting system should be considered as part of a scheme for beautifying the city as a whole and not as a means of advertising one section of a city, perhaps to the detriment of some other locality.

In the early days of electric street lighting the average intensity of the illumination on streets in this country was low; in fact, very much lower than was customary in Europe. Progressive business men took steps to improve this condition by installing "white ways" along the streets adjacent to their property. This led to the installation of a conglomerate collection of lighting units of different types, some in operation and others derelict, so that the "white way," instead of being a thing of beauty, often became an eyesore until it was removed or merged into a general scheme of ornamental street lighting.

In recent years the intensity of street illumination has been materially increased and the necessity for brilliant lighting in individual localities has disappeared. An appreciation of this condition helps in solving problems in connection with ornamental street lighting because it opens the way to the proper financing of an installation and the maintenance of the system when completed.

Considerations Involved in Installation of Lighting Systems.

The cost of the installation of an ornamental street-lighting system might very well be borne by the property owners on the street where the ornamental system is to be installed, but the maintenance of such a system should be borne by the city as a whole.

The most satisfactory way of financing an ornamental street-lighting system is for an improvement district to be created and the adjacent property owners assessed on a front-foot basis in the same way as they would be assessed for any other municipal improvement. In general the expense to the property owner for the complete installation under a scheme of this character is very low—usually not more than $1.50 per front foot—while the cost to the individual citizen for maintenance of the improved system from which he receives material benefit is negligible.

It is thought that the central-station company should discourage the indiscriminate installation of ornamental posts outside business premises, and all suggestions for "white ways" should be subject of careful consideration and consultation with the city authorities before the central-station company takes an active part in their promotion. "White ways" should always be considered in connection with the "city beautiful" idea and in the light of ornamental systems benefiting the city as a whole rather than as a means of advertising some particular locality.

It is of the utmost importance that the ornamental lighting system shall be in keeping with its surroundings and so designed as to give the maximum amount of illumination with a minimum of glare. Too often this point is overlooked with the result that the whole system is spoiled by the use of incorrect glassware.

The manufacturers of ornamental street-lighting devices may with advantage be consulted and their suggestions given serious consideration before any ornamental system is designed. Manufacturer of this class of apparatus have collected valuable data on the subject which is at the service of any city interested in the proposition.

The central-station company is particularly interested in the maintenance of ornamental lighting systems. From the central-station standpoint as well as from the city's a series system is usually the best to adopt, and if lamp renewals are covered by the maintenance contract, the central-station company will find that the moving-coil regulating transformer will give the best results, owing to its perfect regulation under all conditions. The ease with which a series system may be controlled and extended render it particularly suitable from a central-station standpoint.

Relative Advantages of Conduit and Parkway Systems.

There has been some difference in opinion as to the relative advantages of a conduit system versus "parkway" or steel armored cable, but the general concensus of opinion is in favor of the latter. The argument in favor of the conduit system is the ease with which damaged cable may be withdrawn from the conduit, but if the installation is properly made this should not be necessary except in the unlikely event of the cable being subjected to mechanical injury, in which case the location of the fault is a comparatively easy matter.

Steel-armored, lead-covered cable should be laid in a shallow trench below the curb or in the

parkway, and in this position it is not likely to be damaged. It is important that ends of the cable where cut should not be exposed to the weather. We are all familiar with the precautions taken by cable manufacturers to seal the ends of the cable before it leaves the factory, but unfortunately very little care is exercised in this direction when the cable is installed. It is quite common during the installation of ornamental lighting systems to see the ends of the underground cable projecting through the ground and exposed to all weathers until the posts are installed and connected. The result is that faults are likely to develop at an early date and the installation becomes a source of trouble and expense.

The best way to install armored cable is to lay it in a prepared trench, leaving a loop at the location of each post sufficiently long to reach the terminal of the disconnecting device in the base of the post, and to pour cement around the loop to form the foundation for the post. This is more satisfactory than the usual method of making the post foundations first, with the conduit elbows for the cable to be drawn through, as it leaves the cable intact until the time the connections are made in the base of the post.

A disconnecting pothead should be used in the base of the post and this should be of such design as to thoroughly seal the ends of the steel-armored cable and efficiently bond and ground the steel armor and lead covering. It should also be designed so that the post wiring is automatically disconnected from the underground system and the circuit in the base of post re-established by a short-circuiting device in the event of the post being accidentally broken.

It is desirable that a device be used in the top of the post for relieving the terminals of the lamp socket from the strain of the weight of the cable used in wiring the post.

Types of Glassware Suitable for Street-Lighting Units.

There is considerable difference of opinion among engineers as to the best type of glassware for street-lighting units, but the concensus of opinion is in favor of diffusing glassware for ornamental units, owing to the practical elimination of glare with this type of glass.

Glare within the range of vision of the pedestrian or vehicle driver should always be avoided. It causes the pupil of the eye to contract in an effort to protect the delicate mechanism of the retina, thus preventing the observer from seeing as well as he would be able to do with a light source of lower intensity but more perfect diffusion. We are conscious of this phenomenon when entering a moving-picture theater from a street flooded with sunlight; at first no details can be seen, but when the eye becomes accustomed to the light, or, in other words, when the pupil becomes dilated, permitting more light to enter the eye, the interior details become visible.

Although during the war there were few developments in street-lighting units there has been great activity in this direction since the armistice, and we may look for many new devices in the near future which will materially assist in the efforts of making the "city beautiful" an accomplished fact.

EFFECT OF LACK OF WHITENESS IN ULBRICHT SPHERE.

Results of Tests Show Error of Approximately 5%, Due to Ageing of Paint and Selective Transmission of Window.

The theory of the Ulbricht sphere as used in determining the mean spherical candlepower of lamps calls for an inner surface which is perfectly diffusing and non-selective as to color, writes F. E. Cady in the *Journal* of the Franklin Institute. These conditions are only approximated in spheres as actually constructed and used. Most white paints change their color with age, and it seems desirable to know how much error an appreciable departure from whiteness will cause when measuring lamps differing in integral color value, as, for instance, in comparing gas-filled tungsten lamps with vacuum tungsten lamps.

A test of this effect was made, using an 80-in. sphere with a painted inner coating such that its color differed from white as much as a tungsten lamp would change in color if operated at a temperature approximately 200 deg. lower than normal. The window of the sphere had a selective transmission which changed the color of the transmitted light by approximately the same amount. Two different methods were used. One consisted in determining the mean spherical candlepower of some lamps colored so as to have their light match that of a kerosene flame, in terms of normal vacuum tungsten lamps, first with an ordinary photometer and then in the sphere. The other method consisted in getting the ratio of a colored lamp to a normal vacuum lamp, each having been previously measured in terms of a comparison lamp of the same color.

The results showed an error due to the selectivity of the paint and the window of 4.5% by the first method and 5% by the second. Part of the small discrepancy could be accounted for by ageing of the paint during the month or so which elapsed between the tests by the two methods. It is concluded that where the color differences are not more than those occurring in the measurement of gas-filled lamps in terms of vacuum lamps, the paint can depart appreciably from whiteness without causing a very large error.

WORLD'S LARGEST ROLLING MILL IS ELECTRICALLY DRIVEN.

What is claimed to be the largest rolling mill in the world has recently been placed in service at Dorman & Long's Warrenby mills near Durham, England. The installation is electrically driven, involving 20,500 hp. in motors. It is a 42-in. plate mill, reversing type. Each roll is 3 ft. 6 ins. in diameter and 9 ft. 6 ins. long. Slabs weighing 10 tons with dimensions up to 7 ft. by 4 ft. 6 ins. by 1 ft. 6 ins. can be handled. Such slabs are rolled into plates three-eighths inch thick or over and attaining a width of 9 ft. and length of 100 ft. For two hours the output is 60 tons per hour; after this it is half as much for the remainder of the shift. The motor driving the rolls weighs 420 tons and the revolving parts weigh 120 tons. In less than three seconds it can be reversed from 40 r.p.m. in one direction to the same speed in the opposite direction.

Automatic Regulation of Electric Arc Furnaces

Speed of Regulation a Governing Factor in Economical Production—Accuracy in Maintaining Uniform Current also Important —Description of Regulator That Controls Motors for Electrodes

The increasing use of the electric arc furnace in the steel and ferro-alloy industry has brought with it a demand for more suitable devices to maintain steady electrical conditions in the furnace. When the charge is of a low electrical resistance, such as steel, the arc is inherently unstable unless a large amount of external impedance is inserted in the circuit. The use of external reactance for the purpose of regulation is usually objectionable from the power company's standpoint, due to the detrimental effect it has on the power-factor of the system. The only alternative, therefore, for the regulation of a furnace using a low resistance charge is the employment of an automatic regulator which is quick to respond to changes in the arc conditions.

It is well known that in attempting to obtain automatic regulation of any quantity, two features are always desirable which are diametrically opposed to each other. These are speed of regulation and precision in the quantity being regulated.

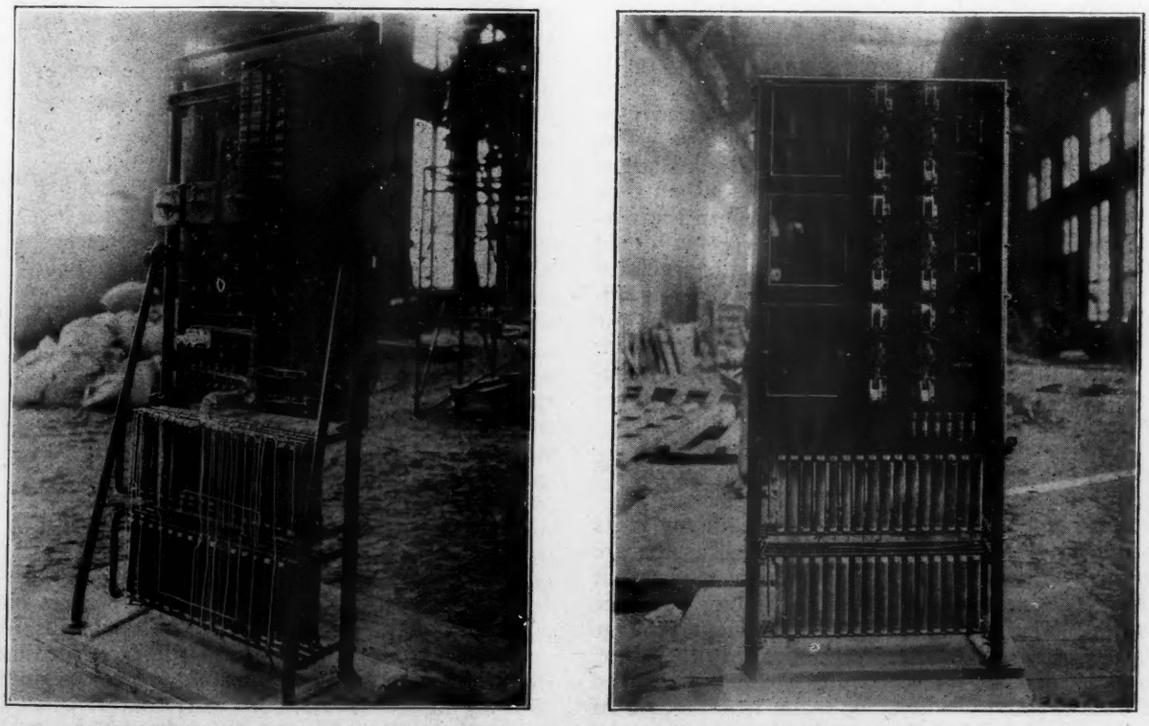
Speed is particularly essential in a regulator to be applied to a steel furnace, due to the fact that this is a governing factor in the economy of operation. The regulator which will melt the steel in the shortest time will show less loss in the furnace due to radiation and also will permit a greater tonnage per hour.

Accuracy in maintaining uniform current is no less a feature from an economical standpoint. Power for electric furnaces is generally sold on the demand basis and the regulator which will prevent high peaks of power is the regulator which will show the least cost of power per ton of steel produced.

Speed and Precision Chief Features of New Regulator.

The method of regulating the current in the furnace by controlling the electrode motors is incorporated in a new Westinghouse regulator, which also has other features, its two chief points of advantage being its high electrode-operating speed and its precision of regulation, all being accomplished with freedom from hunting.

The regulator is particularly rapid, since an electrode speed of 2.5 to 3 ft. per minute is possible and it will hold the current to within 5% of its normal value. The furnace with a cold charge of steel can be placed under automatic regulation with the rheostats set at full power, and at the end of 8 to 10 minutes a sufficient pool of steel will have been formed to give stable electrical conditions. The freedom from atten-



Front Views of Automatic Furnace Regulator for Control of Three Movable Electrodes.

tion by the melting crew allows them to give their entire attention to the metallurgical aspect of melting, and may result in reducing the number in the crew, particularly if many furnaces are charged and tapped in rotation.

The promptness with which this regulator brings current surges back to normal is responsible for a considerable reduction in the demand load, especially when a short demand period is the practice of the power company.

The speed with which settled conditions are attained reduces the over-all time per charge and permits a greater production of steel per hour. The high accuracy of regulation permits the melter to obtain more uniform results and allows him to govern the conditions within the furnace to better advantage.

Simple and Rugged Construction Permits Minimum of Attention.

Mechanically, the device is simple and rugged, and experience with previous installations shows that it is practically free from need of attention. The ability of the regulator to incorporate high speed with a narrow current zone is due to the fact that the electrode speed is not constant throughout the period of functioning of the regulator, but tapers from full speed to zero as the regulated current approaches its normal value. In other words, within certain limits of current the restoring speed bears a definite relation to the amount the current deviates from normal at a given instant. This permits the greatest possible electrode speed for restoring the current after each tendency to change from its normal value, a feature of speed which is particularly noteworthy during the melt-down of cold scrap. For small variations in current the speed is sufficiently slow to prevent continuous breaking of the arc, and at the same time, when the solid metal begins to cave into the pools of molten steel under the electrodes, sufficient speed is available to permit the regulator to extricate the electrodes before the time-element relays allow the breaker to trip with the overload surge of current. Graphic charts show that the arc is actually made and broken during but a very few minutes and the time during which the larger current surges take place is not more than 8 or 10 minutes with average scrap. When the current is turned on to a furnace charge with cold scrap it is only necessary to throw the regulator controllers to the automatic position. Regardless of where the electrodes are at this time the regulator will allow each one to descend until it touches the steel, when complete automatic regulation will commence. No attention is required of the operating personnel.

Arc Voltage and Arc Current Used for Controlling Electrodes.

An important feature of this regulator is its utilization of the arc voltage as well as the arc current for controlling the electrode motors. It prevents the electrodes from getting into the steel under automatic regulation. Under-voltage relay trips on the control circuit are, therefore, unnecessary. With any purely current-actuated device, provision must be made to take care of interruption of the a-c. voltage to prevent the electrode from burrowing into the steel. With the voltage control the electrode motor must stop as soon as any one electrode makes contact with the steel.

On two-electrode single-phase or on two-phase furnaces a purely current-actuated device will not insure balanced voltages across each arc. In fact, one electrode may be submerged in the steel and the entire regulation may be accomplished by the other electrode. The voltage control compels balanced voltages across the arc as well as balanced phase currents. Another good feature of the voltage coil on the control is that it makes the control of each electrode independent.

This equipment may be adapted to a furnace melting an electrically conducting charge and having any number of movable electrodes. There are two parts for this equipment—the control panel and the regulator panel. In installations where the regulating equipment only is supplied the control panel is mounted on a pipe frame. When a switchboard is supplied with the regulator, the control apparatus is incorporated in the switchboard and a separate mounted control panel is not required.

Construction of Control Panel Used in Connection With the Regulator.

The separately mounted control panel for the single-electrode regulator measures 16 ins. by 25 ins. and that for the three-electrode furnace is 24 ins. by 25 ins. They are mounted on iron

Rear View of Automatic Regulator for Controlling Electrodes.

pipe frames 5 ft. 4.5 ins. high, and contain one of each of the following pieces of apparatus for each electrode: One current-adjusting rheostat, one drum-control switch, and one voltage-indicating light. In addition, each control panel is provided with a d-c. fused switch which controls

all d-c. energy to motors and control circuits, and which may be considered primarily as an emergency switch that may be opened should any trouble be encountered with the motors or control equipment. It is thoroughly protected and no live parts are exposed to endanger the operating personnel. The purpose of the rheostats is to permit the furnace operator to get any electrode current he desires within the limits of the equipment.

The voltage-indicating lights are connected between each phase and the furnace shell and indicate the relative voltages across the arc. The drum controllers are provided with four positions as follows: "automatic," "raise," "off," and "lower." These controllers are small and the handles are convenient to the furnace operator They are provided with a star-wheel in order that they may be "felt" through their various positions. The "automatic" position places the motors under the control of the regulator, the "raise" postion connects the motors to the line in such a way that they raise the electrode, and the "lower" position causes the motors to lower the electrodes. The "off" position disconnects the motors from the line.

In addition to the regulating equipment proper current transformers are required. Two of these are needed on a three-phase furnace and one on a single-phase furnace. Other types of furnaces require different numbers of transformers depending upon their connections.

Features of Equipment for Regulator and Control Panels.

On the back of the electrode control panel is mounted a terminal board, all terminals being marked to correspond to the wiring diagram. The wiring for both a-c. and d-c. circuits is brought to this panel or to the switchboard if no panel is furnished and distributes from its terminal board. Such an arrangement insures the least possibility of error in wiring up the regulator and also permits a very convenient way of checking up trouble with the wiring should it develop after the equipment has been installed.

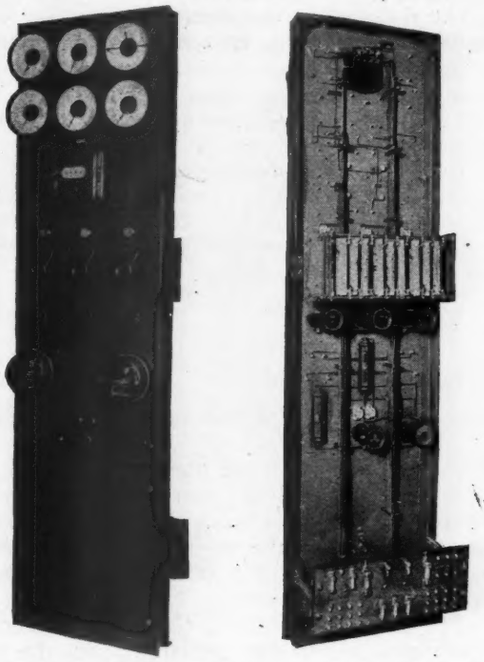
The regulator panel contains the control element, the magnetically operated switches which control the electrode motors and the necessary resistances, capacities, switches and fuses, etc.

There are two springs on the board which hold the lever in its horizontal position when the a-c. supply is disconnected. The lever is pivoted in the middle and both solenoids pull up. The regulator panel is preferably mounted in the transformer room or in some other more or less protected place. A small rheostat is mounted on the back of the panel for each electrode that the regulator is to control, and is connected in the voltage-coil circuit. Its purpose is that of limiting the maximum current for which the rheostat on the control panel can be set. It also provides a means of balancing the current in each electrode for equal settings of the rheostat on the control panel.

Method of Operation.

The diagrams show the connections to the control element for one of the electrodes. The two sets of contacts on the lever control the electrode-operating motors through the medium of magnetically operated contactor switches which are mounted on the regulator panel.

Assuming that the furnace is about to be started up, neither of the solenoids on the main



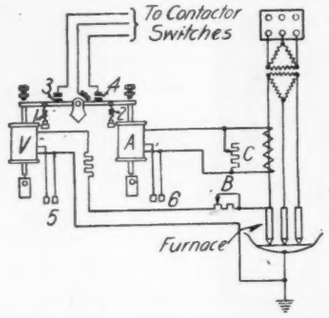
Front and Rear Views of Meter and Control Panel Used with Regulator for Three-Phase Furnace.

control element, *V* or *A*, will be energized until the main breaker on the high side of the furnace transformer is closed. Under these conditions the two springs, 1 and 2, will hold the lever in a horizontal position maintaining contacts 3 and 4 open. On closing the main breaker a potential difference will be immediately created between each electrode and the shell of the furnace. The voltage coil, *V*, is now energized and pulls up on its core the closing contact, 3, and operates the electrode motor in a direction to lower the electrode continuously and at full speed until it makes contact with the bath. As the voltage coil is connected between the electrode and the furnace shell, its current will be shunted and it will become de-energized the instant the electrode makes contact with the steel, thus allowing the lever of the main control element to return to its horizontal position and open the motor circuit. As no alternating current circuit in the electrode can exist until two or more are in contact with the bath, the current coil, *A*, will not be energized until one of the other electrodes is lowered sufficiently to strike the steel. As soon as the circuit is completed the current coil, *A*, becomes energized. Contact 4 closes and causes the electrode motor to raise the electrode, thus drawing an arc to the bath.

The sequence of operations is similar for phases 2 and 3. The motor continues to raise the electrode until the voltage across the arc to neutral increases to such an extent and the current in the electrode decreases to such an extent that the pull of the coil, *A*, is equivalent to that of the coil, *V*. The lever will then assume a horizontal position and will open the motor cir-

cuit. Any disturbance of the equilibrium between the pulls of the coil, *A*, and the coil, *V*, due to variations in the arc will cause either contact 3 or 4 to close, thus operating the electrode motor in a direction to compensate for the disturbance.

The rheostat, *C*, is connected across the series transformer and by changing its position the



Wiring Diagram of One Unit of Automatic Regulator.

value of the current per phase for a given current in the coil of the current element can be altered at will within the limits of the apparatus. On the regulator the regulated current can be varied from the rated value to approximately 20% of the rated value.

The auxiliary contacts, 5 and 6, are mechanically attached to but insulated from the magnetically operated contactor switches which control the electrode motors. Contact 5 closes when the "lower" contactor switch closes, and contact 6 closes when the "raise" contactor switch operates. These contacts shunt respectively a part of the coils, *V* and *A*. Therefore, after the lever has moved in a direction to operate the "raise" contactor, the auxiliary contacts attached to this switch will close, thus shunting a part of the coil, *A*, and tending to restore the lever to its horizontal position. If the change in pull is sufficient to allow the lever to operate, its contacts will separate and allow the contactor switch to open. If the motor has not moved the electrode a sufficient distance to adjust the electrode current to the value for which the regulator is set during the time that the contactor switch was closed, the pull of the coil, *A*, will still overbalance that of the coil, *V*, and the "raise" contactor switch will again close the contacts, 4. A vibrating condition will thus be set up.

If the current per phase is more than approximately 15% above or below its normal value, the change in pull on short-circuiting a part of winding on the coil, *A*, by the auxiliary contacts will be insufficient to allow the core to drop. The contactor switch will, therefore, remain closed and the electrode motor will operate continuously in a direction to compensate for the current variation above or below normal. As soon as the current approaches to within approximately 15% of normal, the change in pull on the solenoid, *A*, when auviliary contacts 5 close is sufficient to allow the core to drop out and to bring the lever to its horizontal position. Between this 15% point and the normal value of the current the regulator assumes a vibrating condition and the motors are subjected to a series of impulses, the average time the motor is connected to the circuit being a function of the amount the alternating current deviates at any particular instant from its normal value.

Two Distinct Stages Involved in Operation of Regulator.

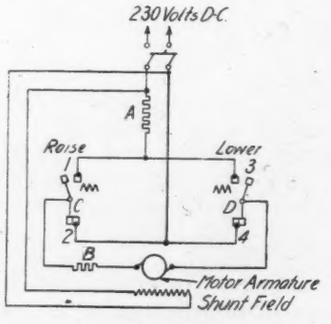
There are two distinct stages, therefore, in the operation of the regulator, one being the continuous running stage, and the other the vibrating stage. The vibrating feature permits the motors to operate at high speed until the current in the electrode has been brought back to within 15% of normal (approximately) when the speed is gradually reduced to zero. High speed and freedom from over-shooting are thus obtained.

In the schematic diagram of the one-electrode motor circuit, *C* and *D* are two double-acting contactor switches of rugged design which start, reverse and apply dynamic braking to the electrode motors. They are standard 75-ampere switches and in this application are called upon to handle only about 20 amperes, the factor of safety being apparent. *A* is a resistance in the supply circuit which acts as a starting resistance, and *B* is a smaller resistance which acts as a braking resistance when the motors are brought to a stop. The shunt field is permanently connected to the d-c. supply.

If the current in one electrode has fallen below its normal value the main control element will close the switch *D*, thus connecting the motor to the line through the resistances *A* and *B*. When the current has reached its normal value the control element lever will assume a horizontal position and the switch *D*, will open contact 3 and close contact 4. Contact 2 has been closed during this operation and the motor armature is now short-circuited through the resistance *B*, thus applying dynamic braking to the armature. It is to these contactor switches that the auxiliary contacts are mechanically attached.

Resistances *A* and *B* of the schematic diagram are adjustable by taps and are thus made adaptable to any 230-volt motor between 2-hp. and 5-hp. rating. The taps also permit adjustment to take care of any conditions that may be encountered.

As has been stated, the voltage between the



Wiring Diagram Showing One-Electrode Motor Circuit.

bath and each electrode is utilized in addition to the electrode current for its operation. It is necessary, therefore, to obtain in some way electrical contact with the liquid steel. In a basic-lined furnace the conductivity of the lining is

sufficient and no further precaution need be taken. With an acid lining, however, the lining is practically a perfect insulator and it becomes necessary to insert metallic electrodes. These may take the form of 0.5-in. round steel rods tapped or riveted to the steel shell and allowed to project through the lining. Electrodes of this diameter will have no undesirable effect on the lining and they will not cut out.

AMERICAN TELEPHONE ONE OF THE AGE WONDERS.

Number in Use Has Increased 64% in Ten Years in Thirteen Population Centers—Figures for Different Areas.

The advance of the telephone from the status of a scientific toy to that of a business and social necessity has been one of the wonders of the age. The telephone and the automobile, two products of modern civilization, have nowhere else in the world been popularized to the same extent as in the United States.

Figures prepared by statisticians of the American Telephone & Telegraph Co. reveal some truly surprising increases in the past ten years in number of telephones per 100 population in the principal cities of the country. The comparison, which is shown in the following table, is based on the 1910 and 1920 censuses. It should be explained that these telephone areas in many cases include places other than the city after which they are named, and the population and telephones in these outlying places have, of course, been included. For this reason the population figures will not always agree with those reported by the United States Census for the cities named in the statement.

City	Population of Area	Number of Telephones	Telephones per 100 Population Jan. 1, '21	June 1, '10
New York	5,621,000	845,890	15.0	7.9
Chicago	2,701,000	554,114	20.5	10.0
Philadelphia	1,824,000	199,650	10.9	7.1
Boston	1,562,000	272,244	17.4	9.1
Detroit	1,125,000	134,491	12.0	11.3
St. Louis	1,029,000	92,603	9.0	6.7
Cleveland	904,000	109,371	12.1	6.6
Pittsburgh	880,000	110,647	12.6	8.2
Baltimore	734,000	79,011	10.8	7.1
Los Angeles	642,000	136,598	21.3	...
Cincinnati	594,000	90,485	15.2	9.8
Buffalo	533,000	65,042	12.2	6.0
Milwaukee	525,000	74,153	14.1	8.6
San Francisco	520,000	143,318	27.6	16.6
Newark	491,000	46,543	9.5	...

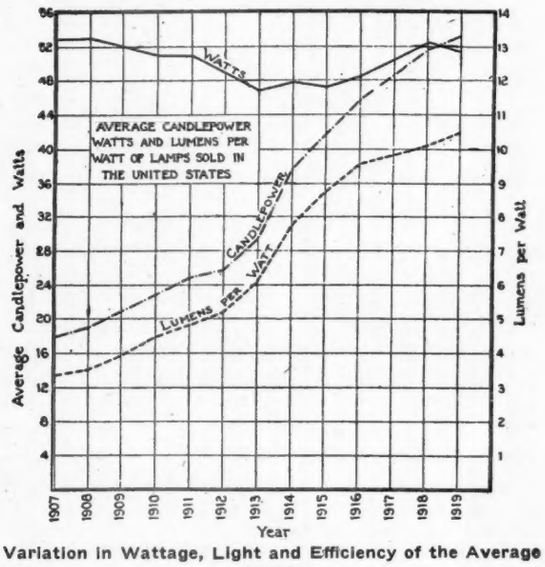
For the thirteen centers of population for which figures appear covering both years, the number of telephones per 100 of population averaged 8.8 in 1910 and 14.5 in 1920, or an increase of 64%.

DEVELOPMENT IN CAPACITY AND EFFICIENCY OF LAMPS.

Total Average Capacity in Watts per Lamp Has Remained Practically Constant While the Efficiency Has Steadily Increased.

The tendency towards the use of more light is well shown in the accompanying illustration, which presents the variations in individual lamp rating from year to year in average watts, candlepower and lumens per watt. From 1907 to 1912 the growth is fairly steady and slow, involving a decrease in the lamp wattages accompanying a slow increase in efficiency. From 1912 to 1916 the growth in efficiency was steady and at a much more rapid rate. This increase in efficiency was reflected in a further slight decrease in wattage. However, the improvement in the lamp was so great as to overbalance the reduction in size and result in a rapid increase in actual candle-power output. From 1916 on there has been a steady improvement in the efficiency of the average lamp accompanied by an almost steady increase in its wattage. These two factors combine to carry on the average candlepower curve in a uniform increase.

These curves, which form part of the report of the lamp committee of the National Electric Light Association, well represent the attitude of the public towards lighting during the period



Variation in Wattage, Light and Efficiency of the Average Lamp.

involved. In the early period, the attitude was one of economy shown by the decreasing wattage. The middle period, from about 1913 to 1915, was a period of awakening to the advantages of electric light. During this time the lamp wattage held steady in the face of rapidly advancing lamp efficiency. The final period is one in which a steady increase is made in lamp output in excess of the increase in efficiency. This shows that the general public is coming to a realization of the fact that light, as a medium of comfort, convenience or service, has a value much in excess of its cost. The public is beginning to demand not merely light but sufficient and adequate light.

DESCRIPTION OF NEW ELECTRON TUBE TRANSMITTER.

In order to utilize a radio-frequency wave train of given power most effectively in a non-oscillating receiving system it must be completely modulated at some suitable audio frequency. A convenient way of accomplishing this modulation, when an electron tube generator is used, is by supplying the plate circuit of the tube or tubes with an audio-frequency alternating e.m.f. An alternator may be used with suitable transformers to supply both the filament and plate circuits. A self-contained transmitting set of this type has

been designed and built at the Bureau of Standards, Washington, D. C. A description of the set, with photograph and diagrams, is given in the bureau's scientific paper No. 381, entitled "An Electron Tube Transmitter of Completely Modulated Waves." Overall efficiency as high as 35% is obtained with set. Transmission and reception tests are described, in which the waves were received by heterodyne methods and also with a crystal detector.

SPOT-WELDING MORE EFFICIENT IN STRUCTURAL STEEL WORK.

Electric Welding Produces Stronger Joints With Less Labor and Greater Economy in Metal Than by the Riveting Process.

Spot-welding, with which the layman is less familiar than with arc welding, is fast supplanting the riveting process in steel construction. This is due to the advantages of electric spot-welding in strength, speed and saving in cost. These are the points that most interest the construction and efficiency engineers.

The field of the spot-welder is obviously that of doing all the work previously accomplished by the riveter, and in many respects doing it more quickly and better than by riveting. In the riveting process good metal is cut away to make room for the softer metal of the rivet. For that reason the riveted joint has less strength than the plates, and there is the additional weight of the rivet heads. With spot-welding the overlap of material is not so great as in a riveted joint, there being a consequent saving in metal. At the same time, by making a sufficient number of spots, the joint may easily be made stronger than the sheets being welded together.

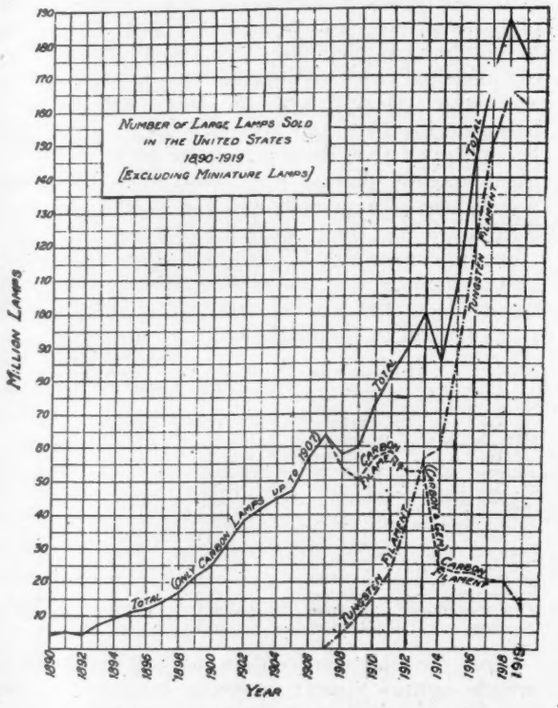
One important disadvantage has been found in spot-welding, however. It involves a single-phase intermittent load which, with a system of small capacity, will seriously affect the voltage regulation of the distributing lines. If several spot-welders are used, however, they can be placed on the different phases in a manner to reduce disturbances to a small value.

At present the largest steel plates that can be successfully joined by spot-welding have a thickness of about three-fourths of an inch. This thickness requires a machine capable of exerting a pressure between the electrodes of about 15 tons, with an alternating current of about 75,000 amperes. Machines for spot-welding are manufactured in sizes ranging from the small welder exerting a pressure of a few pounds at the electrodes and using 400 to 500 amperes, to the huge welder mentioned above, which has hydraulic arrangements to furnish the pressure, and a transformer of approximately 6000 kv-a. to supply the current.

Where such large currents are used the reactance of the secondary loop, including electrodes and transformers, may be so great as to definitely limit the current obtainable. The only remedy for this is to shorten the loop by putting the transformer quite close to the electrodes. In order to weld very large plates another difficulty is here presented. If necessary to weld a spot near the center of the plate the electrodes must reach to a considerable distance over and under the plates. Thus, for a given piece of work there is a minimum limit to the secondary circuit. For the purpose of overcoming this difficulty there has been designed a duplex spot-welder with two electrodes above and two below the plates to be welded. Two transformers are used, each being placed close to a pair of electrodes which form part of their secondary circuit. Thus the path of the heavy current is greatly reduced and the trouble from reactance in the loop minimized. This duplex welder makes the spot-welds in a single operation, thus increasing the speed and efficiency of the welding.

INCANDESCENT LAMP SALES IN THE UNITED STATES.

The total sales of incandescent lamps (excluding miniature) in the United States during the year 1919 is estimated to be 175 millions of lamps, a decrease of 11 millions (about 6%) from the previous year. The number of lamps sold each year from 1890 to date is shown in the accompanying curves. The sales of "Gem" lamps, which have a carbon filament, are included in the sales of carbon lamps. The "Gem" lamp is no longer on the market, its manufacture having been discontinued in the early part of 1919. The tantalum lamp was on the market from 1907 to 1912, but on account of the relatively small numbers sold it is not shown on the curves.



Number of Incandescent Lamps Sold Yearly in the United States.

Of the total sales in 1919 it is estimated that 162 millions (92.5%) are tungsten-filament lamps, a decrease of 4 millions from the previous year's sales, and 13 millions are carbon lamps (7.5%), a decrease of 7 millions. It will be noted that the relative number of tungsten-filament lamps has increased in 1919 over the previous year.

EDITORIAL COMMENT

Display Lighting in the Daytime

Illuminated signs, especially those advertising moving-picture theatres or other places of amusement, are sometimes lighted during daylight hours. Many of these signs consist of several hundred lamps, and the use of a considerable amount of electrical energy to illuminate an advertising sign that rarely shows to great advantage in the daytime appears at first sight to be wasteful and therefore a practice to be condemned.

A thorough investigation of the practice of using energy for advertising signs in the day reveals the fact that in many cases those who have adopted it are convinced that the returns fully justify the expenditure for energy and lamps. The practice is probably not always justified: but given the necessary conditions, such as a densely thronged street in a big city, a large and attractively illuminated sign will unquestionably arrest the attention of many who would otherwise have passed by unheeding.

The same is true of show-window lighting. When we see a window artificially illuminated in broad daylight we no longer accuse the merchant of carelessness in omitting to switch off the energy, but we may be inclined to speculate on the economic advantage of lighting show windows during daylight hours.

It is true of almost any carefully planned and well-lighted show window that the goods are displayed to better advantage at night than in the daytime, and if the advantages of artificial lighting could be obtained in the daytime, the merchant would rarely be deterred from using electricity because of the cost. His principal trouble at present appears to be that he has not enough intensity of artificial illumination to make it worth his while to compete with the daylight. In other words, it is difficult to avoid reflections of brightly lighted objects in the street which interfere with a proper view of show-window displays in the daytime, but with very much higher intensities of artificial lighting by day than by night, the advantages of night lighting may be obtained in the daytime, and many an enterprising merchant would not hesitate to pay the bill for the electrical energy in return for the advertising value of such daytime illumination.

If there are engineering difficulties in the way of producing the desired effect involving a special disposition of the lighting units, and perhaps some means of carrying off the heat from the lamps, these can unquestionably be overcome if the subject is taken up seriously by illuminating engineers. An increased lighting load during the hours of daylight would be very desirable for the central stations.

Demonstrating the Value of Illumination

Good lighting sells itself to the factory manager when properly called to his attention. Industrial executives are just coming to a realization of the fact that light is one of the important tools of production. Highly efficient and of low cost, good illumination is in demand in every industrial plant where work must be done away from daylight. Until quite recently it has been generally conceded that night work, or work at any time under artificial light, was slow, inefficient and uncertain as to quality. However, good lighting has long had a small following of men who fully realized its great potentialities, and who have persistently advocated improvements employing many different arguments to awaken an interest and drive home their point. Some industrial plants have been well lighted to promote cleanliness, some have been well lighted for safety and some are lighted for advertising purposes. Experience gained in these establishments finally pointed the way to a general development of the industrial lighting field. It was found that production costs were less in well-lighted establishments than in poorly lighted ones. Actual figures showing cost reductions far in excess of the lighting costs could not be disputed, and executives who would not light their plants for cleanliness, safety or display commenced to demand light as an agency of more production and reduced costs.

Plants formerly lighted to 1 or 2 foot-candles have been re-lighted with intensities of 8 to 12 or 15 foot-candles, in many cases the increased production and decreased costs being greatly in excess of anything anticipated or hoped for. Trial installations are almost invariably followed by complete re-equipment where the facts are properly determined and the figures properly handled.

Realizing the importance of good lighting as an agency of prosperity in the community, as well as a source of new business, the electrical interests in a number of cities have undertaken the task of showing their customers just what the differences are in lighting. On other pages

of this issue appears a description of a demonstration room used in Cleveland. Many people have been convinced of the value of good lighting and have learned the difference between good light and poor light by demonstrations given in this room. With the way pointed out, it is time for the interests of the various communities to join in a campaign of education for improved industrial illumination. The central station will profit by increased load, the dealer will profit by increased sales, the contractor will have more work to do and the customer will be glad to pay the bill because it will mean reduced costs and increased profit to him. The old standards can no longer be justified on any basis and a little concerted campaigning is all that is required to establish the new order.

Time need not be wasted in the start on the plant manager who is not interested; he will develop an interest after his competitor or neighbor has commenced to reap the rewards of progressiveness. By giving attention to the early installations and securing the actual facts regarding the relation of illumination changes and production, a fund of information can be built up and used in convincing the less progressive executive. The field is open and large, and equipment is available to meet every need. Lack of enthusiasm or harmony on the part of the electrical interests of the community is all that will prevent an enormous development in industrial lighting.

Light and Safety

The development of methods of artificial lighting has made possible great extension in human activities. Industrial operations, for example, are no longer limited to the daylight period, but can be carried on at all times if adequate illumination is provided. With the increase in lighting efficiency has come added accident liability, partly because of the increased activity, but mostly because attempts are made to accomplish under insufficient light what might easily be done with adequate lighting. As a result artificial light has come to bear an important relation to human safety. To illustrate this point we quote from an editorial by C. W. Price, general manager of the National Safety Council, as follows:

"Some one has said that light is a tool which adds to the efficiency of every other tool. The modern industrial manager goes a step farther, for he realizes that adequate lighting, both artificial and natural, is indispensable not only to efficiency but also to safety. He knows that the dark plant is the dangerous plant.

"One of the large insurance companies made a careful study of the reports of 91,000 accidents and discovered that 10%—9100 accidents—were caused directly by the absence of proper lighting and that in 13.8%—more than 12,000 accidents—inadequate lighting was a contributing cause.

"The British government in an extensive investigation of accidents found that stumbling and falling are the most frequent causes of accidents resulting from the absence of light and the report of the United States Census Bureau for 1918 says: 'The greatest number of deaths charged to any one accidental cause, 10,330, is shown for falls.' The investigation of the British government also revealed that during the four winter months deaths and serious injuries resulting from falls were 39.5% greater than during the four summer months, thus showing the bearing of light on accidents.

"In all of the industries where efficient safety work is being done and where large reductions in accidents have been made, strong emphasis is placed on good general illumination of all departments. Investigations conducted by one of the leading illuminating engineers of America in some 200 plants in which modern lighting systems were installed revealed that where rough work is being done, as in foundries and steel mills, the total output was increased 2%, while in textile mills, shoe factories, machine shops and other industrial plants where fine work and close application is required production has been increased 10% by the installation of proper lighting.

"The economic value of good lighting becomes readily apparent when it is known that the overhead cost of adequate lighting is not more than 0.5% of the pay roll. In other words, a workman who is being paid $4 a day can be made a more efficient and a more careful workman through the expenditure of approximately 2 cents a day for adequate lighting. Any plant manager appreciates what a very slight increase in production is necessary to add 2 cents to the daily earning power of a workman.

"Industrial managers are coming to realize that light not only increases output and decreases accidents, but also plays a most important part in making the plant a cheerful and pleasant place in which to work. In these days when management is giving the most serious attention to the attitude of men towards their work and to questions of contentment and loyalty, a plant that is light, cheerful and attractive no doubt has a great advantage over the dark, cheerless and unattractive plant.

"Light has a positive influence in encouraging orderliness, cleanliness and efficiency. In a plant where the windows have been washed, the walls whitened, and effective lighting installed, there has followed, almost invariably, a housecleaning on the part of both foremen and workmen—all of which makes for efficiency, safety and contentment."

THE WEEK'S NEWS

Reports of Important Meetings, Developments and Other Happenings of the Electrical Industry and Its Allied Interests

FEDERAL WATER POWER COMMISSION DIVIDES ITS WORK.

Seven Main Divisions Will Be Used in Handling Grants and Supervision of Developments Under New Law.

The work of the Federal Water Power Commission, which will have charge of all development under the recently enacted water-power act, has been divided into seven departments, these departments being as follows: Engineering, accounting, statistical, regulatory, licensing, legal, and operation.

The engineering department is regarded as the most important, and will be in charge of Lieut.-Col. William Kelly, who has been detailed by the Army Department as the engineer officer of the commission. This department will make a general investigation of the electric power industry, power sites, costs and development. It will present the results of its investigations to Congress preparatory to construction work by the United States; will consider construction plans proposed by licensees; will make physical valuation of properties in rate-making proceedings, and when existing plants are brought under the act will determine necessary repairs for maintenance, develop operating rules and determine adequate depreciation reserves.

District offices for the receipt of applications for licenses will be opened in St. Louis and St. Paul in the offices of the United States Army engineers at those points, and in the offices of the Forestry service at San Francisco and Denver. At a conference in Washington, D. C., Aug. 12, between the Water Power Commission and interested parties the form of application for water-power permits was discussed, but the adoption was postponed until a later date.

WESTERN RED CEDAR ASSOCIATION HOLDS MEETING.

Members Vote to Continue Advertising Campaign During the Present Year and Discuss Pole Butt-Treating.

At the fifteenth annual meeting of the Western Red Cedar Association, held in Spokane, Wash., July 30, last, it was decided to continue the national advertising of western red cedar poles for the remainder of the current year and an appropriation was provided for this purpose.

E. L. Clark, Valentine-Clark Co., Minneapolis, Minn., made a report on the progress being made in the butt-treating of poles in which he stated that the National Electric Light Association has been investigating the different methods of treatment of poles, results secured, etc., and is now promulgating new treating specifications with a view of making them complete and standard. Mr. Clark recently accompanied W. K. Vanderpoel, chairman of the overhead systems committee of the N. E. L. A., on an inspection trip to the various treating plants in the West.

The association extended an invitation to the Northwest Geographic Division of the National Electric Light Association to visit the cedar pole butt-treating plant at Sandpoint, Ida., during the convention of the division at Spokane, Wash., Sept. 8-11. A committee was appointed to make arrangements to transport the delegates from Spokane to Sandpoint.

The traffic department of the association will be improved and enlarged in order to better handle the problems that come with the shipment of cedar poles. At the annual election the following officers were named: President, Morton Macartney, Northern Cedar Co., Spokane, Wash.; vice-president, E. A. Lindsley, Lindsley Bros. Co., Spokane, Wash.; secretary, H. C. Culver, Sandpoint, Ida.

SELECT SPEAKERS FOR ELECTRICAL INSPECTORS MEETING.

Men Prominent in Technical Branch of Industry Will Address Delegates at National Association Sessions in Philadelphia.

The National Association of Electrical Inspectors will hold its annual meeting in Philadelphia, Oct. 12-13, the convention headquarters being at 316 Walnut street. The program has not been fully completed but a tentative list of speakers has been announced.

Papers on various subjects dealing with the Electrical Code will be presented by the following men: W. J. Canada, electrical engineer of the National Electric Light Association; Dana Pierce, vice-president of the Underwriters' Laboratories; A. R. Small, superintendent of label service, Underwriters' Laboratories; P. H. Bartlett, superintendent of installation, Philadelphia Electric Co.; Dr. M. G. Lloyd, Bureau of Standards, Washington, D. C., and M. E. Arnold, president of the Electric Club of Philadelphia. Points as to National Electrical Code interpretations will be discussed during the sessions.

At the opening session J. Hampton Moore, mayor of Philadelphia, will welcome the delegates and in the evening they will attend a banquet at the Arcadia cafe, where E. J. Cattell, statistician of the city of Philadelphia, will make the principal address. On Oct. 13 the delegates will make an inspection trip through the plant of the Victor Talking Machine Co., Camden, N. J., while other trips to points of historic interest in and around Philadelphia have been arranged.

The committees in charge of the convention arrangements are as follows: Arrangements, Gilbert S. Smith, chairman; entertainment, Frank E. Groves, chairman; papers, P. H. Bart-

lett, chairman; transportation, William Kerford, chairman; press, Joseph D. Israel, chairman; banquet, M. E. Arnold, chairman; meetings, Mortimer B. Gleeson, chairman; relations, R. Maitland Nesbitt, chairman; question-box, A. H. Lilley, chairman.

Joseph C. Forsythe, New York City, will be the chairman of the New York delegation; Thomas Henry Day, Hartford, Conn., of the New England delegation; William S. Boyd, Chicago, of the western delegation, and Joseph O'Brien, Baltimore, of the southern delegation. W. L. Smith, Concord, Mass., is the secretary of the association.

TRADE ACCEPTANCE PLAN WINS ADHERENTS IN INDUSTRY.

A radical reduction in its losses on customers' accounts has been accomplished by the Western Electric Co. since it adopted the use of trade acceptances two years ago. Figures have been issued by E. W. Shepard, general credit manager of the company, showing that since this method of closing accounts was introduced only 3% of the sales put through under it resulted in loss during the first twelve months, while the loss for the second period was 7%. The loss on sales accepted under the old open account basis during the same two years was 39% for the first, and 27% for the second.

In the first year that it used trade acceptances the Western Electric Co. accepted paper amounting to $1,200,000. This was increased by 211% during the following fiscal period. Although these amounts represent only a very small fraction of the business of the company, the ease with which the system functions and the general satisfaction expressed by most of the customers who have co-operated under it has resulted in a campaign by the credit managers at the company's branch houses to explain its advantages to the electrical trade.

In a recent statement Mr. Shepard said: "I believe everyone will agree they will justify our previous conclusion that trade acceptances do not represent secondary credits. We feel confident that they have not only been a benefit to us but a benefit to our customers as well."

FOWER LINE FROM WASHINGTON TO BOSTON.

Government Survey Will Include Study of Resources and Needs for Production of Electrical Energy in the East.

A survey of electric power production and distribution methods in eastern states between Boston and Washington, including a study of methods for the further utilization of water power in that zone, has been commenced by the United States Geological Survey, the director, George Otis Smith, has announced. The survey is being conducted under authority of Congress, which at the last session appropriated $125,000 for the purpose.

"The chief objective of the survey," said Mr. Smith in a recent statement, "is to investigate the possibilities of economy that might result from the establishment in the Boston-Washington industrial district of a general system for the generation and distribution of electrical power.

"The survey will also include research into the present and probably future demands of the area, including the possible future electrification of industries. All possible sources of power, developed and undeveloped, will be studied. It is estimated that only 10% of the power now used in the eastern seaboard district is water developed.

"The general power production and distribution system contemplated between Boston and Washington, as a result of the survey, would consist of a main artery which would be fed from generating plants along the route, including plants already in use in the various cities. These city plants would sell surplus power to the general line. Feeders from the main artery would carry the power wherever needed in the district. Additional water-power and steam generating plants, located with reference to the source of supply rather than the immediate demand, would be built to supply all the extra power needed."

W. S. Murray of New York is the consulting engineer in charge of the survey, with Lorin E. Imlay, Henry W. Butler and Carey T. Hutchinson as his chief assistants. The survey is expected to be completed in about 18 months.

ENGINEERS MAKE TEST OF RHODE ISLAND COAL.

Experiment Is Made in Pennsylvania Mill and Despite Large Graphite Content Favorable Results Are Obtained.

The extreme scarcity of coal in the New England states is responsible for recent efforts to find a means of relieving the situation. It has been known for many years that there is an abundance of coal in Rhode Island, the quantity available being estimated at 1,000,000,000 tons. It is equally well known that the large content of graphite in this coal prevents its use because it chokes the grates. The choking is due to the failure of the graphite to burn at ordinary firebox temperatures. Should a method of burning this coal be developed, the coal situation in New England will be greatly relieved, if not entirely solved.

The success of pulverized coal from other localities, even when of low grade, has suggested to many that Rhode Isand coal may burn satisfactorily when pulverized. The idea has so many possibilities that preparations are being made to conduct a series of experiments for the purpose of determining its feasibility. To this end the Providence Engineering Society has appointed a committee which has begun work on the problem and is co-operating with concerns in the east.

A preliminary test was conducted on Aug. 3 at the Evansville, Pa., plant of the Allentown-Portland Cement Co. The test was under the supervision of Frederick A. Scheffler, manager of the power department of the Fuller Engineering Co., which has a contract to install a complete set of pulverized fuel equipment at the plant, and which is also assisting the Providence Engineering Society. Because the test was merely preliminary no evaporation observations were made, the purpose being rather to ascertain how pulverized Rhode Island coal would act in the furnace.

The results were encouraging to the extent that

more elaborate tests will be made in the near future. In the tests, the coal and the graphite in it burned at apparently high temperatures and the furnace had the appearance of an oil-fired furnace. Because of its low volatile content, the coal must be fired vertically. In the Evansville plant it is pulverized in the mill and pumped through a 3-in. air line, 1000 ft. to the boiler house. The air pressure at the pump is 40 lbs. per sq. in. The conveyor pipe crosses a valley and rises approximately 60 ft. at the boiler house. The fineness of the pulverized coal is such that 85% passes a 200-mesh sieve and 70% passes a 300-mesh sieve.

A sample of the Rhode Island coal after being dried showed the following content:

Moisture	1.10%
Volatile materials	4.45%
Fixed carbon and graphite	65.72%
Ash	29.83%
B.t.u., dried and shipped sample	9578

The tests were witnessed by a large number of public utility executives, representatives of boiler manufacturers and combustion engineers and experts.

FEDERATED SOCIETIES WILL HOLD MEETING IN FALL.

During the past week approximately 150 engineering societies throughout the United States have received invitations to become charter members of the Federated American Engineering Societies, and also to appoint delegates to attend the first meeting of the American Engineering Council, which will be held this fall at a location to be selected later.

The 150 societies invited to participate in the full organization of the new body comprise national, regional, state and local engineering societies and organizations, and represent a total membership of about 225,000 men. With the invitation was sent a copy of the constitution and by-laws of the new organization as adopted at the organizing conference in Washington, D. C., June 4.

APPLICATIONS FOR WATER-POWER TOTAL 500,000 HORSEPOWER.

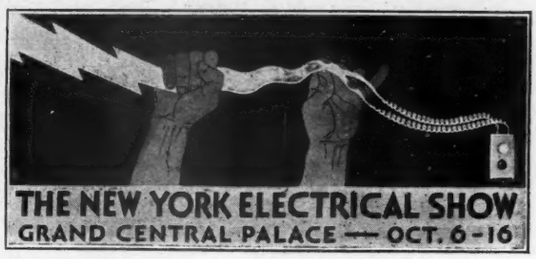
Applications for more than 500,000 hp. in water power have been filed with the Forestry Service of the Department of Agriculture since President Wilson signed the water-power bill in June. The big demand is attributed to increased fuel costs and to transportation difficulties.

SYMBOLIC POSTER FOR NEW YORK ELECTRICAL SHOW.

Design Shows Electricity an Untamed Element in the Process of Subjugation and Is Striking in Its Appeal.

In addition to the customary newspaper advertising the New York City Electrical Exposition this year will use billboards, window cards, mail enclosures and envelope seals in giving publicity to the exposition, which opens Oct. 6 at the Grand Central Palace and will continue for ten days.

The official poster for the exposition has just been completed and is the work of Fred G. Cooper. It shows electricity, an untamed element in the process of subjugation. A vivid flash of lightning dominates one side of the poster. Two hands, typifying human skill, have gripped this flash, tamed it, harnessed it to a push button and put it to work. The poster is in two shades of



Poster Used to Advertise New York City Electrical Exposition.

blue, on a grey background. The hands are flesh color and the push button is in brass.

In addition to its use on billboards, the poster will be reduced in size and used in windows throughout New York City and surrounding territory. A reproduction in miniature will be distributed among all show exhibitors for use as a seal on their correspondence. The advertising for the exposition will be in charge of Cyril Nast, of the New York Edison Co., and will be handled by the Tucker agency, while the publicity work for the exposition will be handled by Norman Maul of the New York Edison Co.

CHEMICAL INDUSTRIES EXPOSITION HAS 400 EXHIBITORS.

Symposiums on Chemical Engineering, Fuel Economy and Materials Handling Will Mark Business Sessions of Week.

With accepted applications for space over the 400 mark, a new record, the preliminary details of the sixth national exposition of chemical industries in Grand Central Palace, New York City, Sept. 20-25, inclusive, make certain that the show will outclass the five previous ones. The program, aside from the exhibition proper, is also the biggest that has ever been scheduled.

On Thursday afternoon, Sept. 23, the chemical engineering symposium will take place. The American Institute of Chemical Engineers will hold a meeting in the afternoon, and papers of interest will be read. In the evening the engineers will have a dinner at the Technology Club.

Three other symposiums will be held during the week. One will be on fuel economy, one on materials handling, and one on industrial management. The fuel-handling division and the material-handling division have developed such progress that it is necessary to give each a separate section at the coming exposition. Important topics will be discussed on the days these two divisions meet.

Entering as it does practically every phase of industry the exposition offers a remarkable opportunity to the manufacturer and business man to see what has been accomplished since American chemists entered the field in earnest, or during the war. Discoveries that have revolutionized

many manufacturing processes have been made. These have increased production and improved the quality of the merchandise and have resulted in those who have spent money to aid research finding that the investment paid.

A feature of this year's exposition will be moving pictures. These will prove how American chemistry has advanced and the subjects will be placed before the public in a manner that will enable the veriest novice to understand the difficulties that have been overcome during the past five years.

JOINT POLE USE IS DISCUSSED IN N. E. L. A. STATEMENT.

Engineering Department Points Out Effort of Bureau of Standards to Assure Reasonableness of Rules.

In a statement issued Aug. 11 by the engineering department of the National Electric Light Association attention is called to a recent instance of the effort of the Bureau of Standards to assure, as far as possible, the reasonableness of the rules of the National Electrical Safety Code and to relieve them of any controversial character in the Bureau of Standards' proposal to omit rule 230*d* and change rule 230*c* as follows:

> *Rule* 230 (*old* 270*a*).—Two parallel pole lines, either of which carry supply lines (see definition 41) shall, where practicable, be so separated from each other that neither conflicts with the other. If this cannot be done, the two pole lines shall be separated, as far as practicable (see rule 245).
>
> It is recommended that overhead lines, which can not readily be so separated from each other as not to conflict, be placed on a single common pole line, unless the high voltage of certain of the circuits or the large number of conductors makes the use of a single pole line undesirable or impracticable.

Rule 245 contains certain special requirements where one conflicting line very closely approaches another. The bureau rearranged the rules to the extent of making the above change from rule 270*a* to rule 230*c* and omitted the second sentence of the first paragraph entirely. The telephone interests later requested the bureau to add another paragraph, specifying certain high voltages, above which joint pole use was generally not recommended. This proposed wording was as follows:

> 230*d*—*Limitation of Joint Use.*—The joint use of poles by signal lines and supply lines of more than 7500 volts (or 4400 volts to neutral or ground) and constant-current circuits of more than 10 amperes is not recommended except where it is impracticable to separate the lines sufficiently to avoid conflicts.
>
> Between 5000 and 7500 volts (or between 2900 and 4400 volts to neutral or ground), or between 7.5 and 10 amperes for constant-current circuits, conditions in particular cases will determine whether or not joint use of poles should be permitted.

The above was strongly objected to by power companies, but the objections urged were not accepted by the bureau as sufficient to warrant its action until the last few weeks. Meanwhile certain minor amendments have been secured by power companies to make the recommendation against joint pole use for high voltage supply lines somewhat less strong. Recent consideration by the bureau of the fact that it may, in some cases, be more desirable to have separate lines across a street than to have the two lines combined in one and recognition of the fact that the wording of the rule should not be such as to permit an inference which would call for lines to be placed outside of conflict distances, when joint poles are not used (which in narrow streets might drive one of the lines off the street), led the bureau to change rule *c* as follows and omit rule *d* entirely:

> *Rule* 230*c*—*Avoidance of Conflict.*—Two parallel pole lines, either of which carries supply conductors, shall, where practicable, be so separated from each other that neither conflicts with the other. If this is impracticable, then the conflicting line (or lines) shall be built of the grade of construction required by the rules for a conflicting line or the two lines shall be combined in a single pole line (see rule 234).

This expressed no preference for joint pole use as against conflict, it being expected that conditions under which preference should be shown one or the other type of construction can be worked out more satisfactorily than in the proposed rule 230*d* above noted, and such a requirement inserted in a future code edition.

I. E. S. CONVENTION PROGRAM HAS LONG LIST OF SPEAKERS.

Men Prominent in All Lines of Industry Will Make Addresses at Annual Gathering in Cleveland in October.

The tentative program announced for the annual convention of the Illuminating Engineering Society, to be held in Cleveland, Oct. 4-7, lists many men prominent in the electrical industry as speakers and papers on many subjects will be presented.

Following the opening of the convention on Monday, Oct. 4, by the address of President S. E. Doane, various committee reports will be presented, including one on the society's educational program, presented by F. C. Caldwell, chairman of the committee on education. On Tuesday morning the following papers will be presented: "Modified Views on the Theory of Light," by E. F. Nichols; "Some Applications of the Photoelectric Cell," by W. E. Story, Jr.; "Knowns and Unknowns of Light Production," by G. M. J. Mackay; "Optical Principles in Illuminating Engineering," by P. G. Nutting; "Measurements of Reflection Factors," by C. H. Sharp and W. F. Little.

At the Tuesday afternoon session there will be a paper on "Notes on Department Store Lighting," by J. Daniels, and one on "Knowns and Unknowns of Illuminating Principles," under the auspices of the committee on papers. Tuesday evening, J. R. Cravath will present a paper on "Pleasing Proportions of Direct and Diffused Light," to be followed by a home lighting demonstration.

The Wednesday sessions will be devoted to papers on "The Problem of Brightness," by Bassett Jones; "Central-Station Methods for Securing High Lighting Standards in Stores and Homes," by O. R. Hogue, J. J. Kirk and E. D. Tillson; "Some Out of the Ordinary Applications in Mill Works," by S. G. Hibben; "An Improved Method for the Illumination of Motion-Picture Theaters," by L. A. Jones; "Recent

Applications of Color in Lighting," by A. D. Curtis and J. L. Stair; "The High Cost of Poor Lighting," by Ward Harrison; "A New Form of Light Meter," by Davis Tuck, and a report on the work of the I. E. S. among other organizations, presented by the committee on reciprocal relations.

On Thursday there will be papers on "Central-Station Experience in the Improvement of Factory Lighting," by J. B. Wilson, and on "Lighting of Shoe Factories," by A. L. Powell and J. H. Kurlander. The address of President-elect Gen. George H. Harries will close the business sessions of the convention.

FREIGHT RATE INCREASES WILL NOT HURT ELECTRICAL INDUSTRY.

In a symposium of opinions conducted by an Eastern financial newspaper as to the effect the recent increase in freight rates allowed by the Interstate Commerce Commission will have on various industries the consensus of opinion of manufacturers of electrical equipment was to the effect that the increases in rates will work vastly more good for the industry in the form of better transportation than harm through an added burden of expense.

Transportation, it was pointed out, is so small a factor in the manufacture of most electrical products that it is believed the increase in rates will be more than offset by the relief in transportation congestion which will surely follow the re-establishment of railroads on a firm financial basis. Officials of three leading electrical manufacturing companies stated that their concerns would probably find it unnecessary to increase prices at all.

WILL DISCUSS LIGHTING SYSTEMS BEFORE SAFETY ENGINEERS.

H. S. J. Porter, of the Society for Electrical Development, will present a paper on perfect and imperfect lighting systems in industrial plants and factories at the September meeting of the American Society of Safety Engineers. Among the subjects that will be covered in the paper will be the danger factor resulting from imperfect lighting and the reduction of industrial accidents that always accompanies the improvement of an unsatisfactory lighting system.

These subjects will be visualized by means of statistics and other data collected by the society in its campaign for better lighting in industrial plants.

S. E. D. APPOINTS JOHN P. KELLY AS PUBLICITY AGENT.

John P. Kelly, a newspaper man of many years' training, has been appointed publicity agent of the Society for Electrical Development, the appointment being made for the purpose of bringing the activities of the society to the attention of the general public through the medium of newspaper and magazine publications. His work will consist of furnishing magazine articles and authentic information that the householder can read and appreciate without a thorough understanding of electrical phenomena.

Mr. Kelly has had varied and extensive training in publicity work of this nature. Once before he acted in his present capacity, temporarily, when he was in charge of the publicity work of the society while making arrangements for the lighting week campaign. One of his most important commissions was that of eastern publicity manager for the Pan-American exposition in San Francisco in 1905.

MANUFACTURERS ATTEND NIAGARA INDUSTRIAL CONGRESS.

More than 300 manufacturers, representing industrial interests of the United States, Canada and Great Britain, attended the industrial congress, held by the Niagara District Industrial Association, at Niagara Falls, Ont., Aug. 2-4. The manufacturers were the guests of the association for three days and were shown the possibilities of the section as a manufacturing district, including the obtaining of cheap power from the Niagara Falls water-power development and shipping facilities made possible by the opening of the new Welland canal.

NORTHWESTERN DIVISION, N. E. L. A., TO MEET IN SEPTEMBER.

The annual convention of the Northwestern Geographic Division of the National Electric Light Association will be held in Spokane, Wash., Sept. 8-11. The program has not yet been arranged but will consist of papers on subjects pertaining to the welfare of the central-station industry in the Northwest, particular attention being paid to water-power development. L. A. Lewis, Washington Water Power Co., Spokane, Wash., is the secretary of the division.

COMING CONVENTIONS.

Michigan Section of the National Electric Light Association. Annual convention, Ottawa Beach, Mich., Aug. 24-26. Headquarters, Hotel Ottawa. Secretary, Herbert Silvester, Ann Arbor, Mich.

Nebraska Section of the National Electric Light Association. Annual convention, Omaha, Neb., Sept. 8-9. Secretary, B. H. Conlee, Nebraska Gas & Electric Co., Beatrice, Neb.

Pennsylvania Electric Association. Annual convention, Bedford Springs, Pa., Sept. 8-11. Secretary, H. M. Stine, 211 Locust street, Harrisburg, Pa.

Northwestern Geographic Division of the National Electric Light Association. Annual convention, Spokane, Wash., Sept. 8-11. Secretary, L. A. Lewis, Washington Water Power Co., Spokane, Wash.

New England Section of the National Electric Light Association. Annual convention, Kineo, Me., Sept. 13-16. Secretary, O. M. Bursiel, 149 Tremont street, Boston, Mass.

Illuminating Engineering Society. Annual convention, Cleveland, Oct. 4-7. General Secretary, Clarence L. Law, 29 West 39th street, New York City.

National Association of Electrical Contractors and Dealers. Annual convention, Baltimore, Md., Oct. 4-8. Headquarters, Southern Hotel. Secretary, W. H. Morton, 110 West 40th street, New York City.

Empire State Gas & Electric Association. Annual convention, Utica, N. Y., Oct. 7-8. Headquarters, Hotel Utica. Secretary, Charles H. B. Chapin, 29 West 39th street, New York City.

National Association of Electrical Inspectors. Annual meeting, Philadelphia, Oct. 12-13. Secretary, W. L. Smith, Concord, Mass.

International Association of Municipal Electricians. Annual convention, New Orleans, La., Oct. 19-22. Secretary, Clarence R. George, Houston, Tex.

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

SELLING SECURITIES OF COMPANY INTERESTS EMPLOYES.

Gives Worker an Insight Into Business Affairs of Organization That He Could Not Possibly Gain Otherwise.

Study of the various aspects of the plan of selling public utility securities to customers and citizens of the territory in which a company operates by its employes has brought to the attention of executives that, next to the financial aspect of the plan, the immediate effect upon the employes of the utilities is of the utmost importance, especially in the latest development of the plan where companies use their entire force to sell their securities to the public.

Just as one can line up iron filings with the application of a magnet, so the employes seem to fall in with the purpose of the management as the result of this common endeavor. Things about their company that had baffled them, the balance sheet, the "boss'" aloofness, the long-nursed grudge, seem to straighten out. The employes begin to learn about their company's affairs. They find that gross income is not net profit, that the "boss" is the same kind of man they are, and soon the grudge they nursed has suddenly spent itself for want of ammunition.

Through the medium of a big single purpose, having as its object the welfare of all connected with the company, comes the breaking down of departmental jealousies and a spirit of mutual confidence. It might be said that democracy has first dawned in many companies with the advent of this plan. In short, all the employes, from the officers down, get the company's point of view and from that time are transferred from apathetic to useful representatives of the company.

And last among the immediate effects, but not least, the working out of the plan throws into relief many capable men before unrecognized. New opportunities attract ambition and brains and many companies today have in their organizations competent security salesmen, men who a year ago or less were linemen, wiremen or minor clerks in the offices of the company.

URGE COMMITTEES TO STUDY RELATIONS WITH CUSTOMERS.

Commercial Service Committee of National Electric Light Association Says Real Service Organization Can Then Be Built.

In a report presented to the National Electric Light Association, the committee of commercial service and relations with customers suggested that each central-station company form a committee composed of the various departments engaged in serving the public, to formulate and apply efficient methods of conducting relations with customers.

The committee also recommended that the association prepare a course in service relations with customers, similar to the accounting and technical courses. This course should be so prepared that it can be readily understood by non-technical men and in such a way as to appeal to all employes of the commercial and sales groups.

In many commercial lines the danger of untrained salesmen, causing the loss of prestige and business, is fully recognized, and the employment of a new man in a responsible position is considered a direct charge against the business to such an extent that before he is permitted to sell the goods he must first learn the method of their construction and use.

Definite schools for the intensive training of such applicants are often provided, and the period is usually sufficient to convert the unproductive time into the asset of confidence through knowledge gained by the employe, which rapidly turns this period into a value-producing quantity. It is, moreover, the best insurance against the loss of good will, as what is often considered by the public as indifference is found to be ignorance of the matter under discussion.

A position of special importance in a central-station service sales organization is the telephone board, and only employes thoroughly trained for this work should operate it. It is daily becoming a more important link in the company's work through the increased use of the telephone by the public to transact its business with the utility. The prediction has been freely made that eventually a greater volume of service sales will be made over the telephone board than is now handled by the counter salesmen. This is already the experience of several large companies.

In the issuance of service applications and orders, it is important that trained employes be used to prevent the loss of time by the operating departments which often occurs through incomplete or indefinite information being stated on the order. For example, if the order fails to give a definite address or state when the house will be open, it may mean a disappointment to the customer in not receiving service when desired, or in the operating department making several unnecessary trips to the premises.

When a customer seeks information concerning his account, advice on the use of his equipment, or complains of his bill or his service, he should be met by the most capable employes in the service department. The employe should thoroughly appreciate the responsibility of building good will, and the consequences of failure to impress the customer with the spirit of service and fairness. To this end the individual treatment of each case should be strongly emphasized, as the biggest factor in such work is the interest displayed in serving the customer.

A complaint which may appear small in the eyes of the utility is of considerable importance to the customer and should therefore be thoroughly investigated, without any tendency toward a routine method. It must not, under any consideration, be pre-judged. A pleasing personality and the proper training are the keynotes of such work. The cost of service should be secondary to its delivery, as it, indeed, is the molder of public opinion. The value of good will is in the balance and unless the weight of good service tips the scales of public judgment in the utility's favor, it has been a costly service at any price.

METROPOLITAN EDISON CO. RAISES LIGHT AND POWER RATES.

The Metropolitan Edison Co., Reading, Pa., has announced an increase in its service rates totaling about 20% for all commercial lighting and industrial power, effective September 1. The company states that the advance is necessary owing to increased operating expenses, including fuel, aggregating 75%. About 13,000 tons of coal are used monthly.

CHICAGO MAN WINS H. L. DOHERTY PRIZE FOR PAPER.

F. E. Andrews, Public Service Company of Northern Illinois Employe, Takes Honors in N. E. L. A. Annual Contest.

F. E. Andrews, a general office employe of the Public Service Co. of Northern Illinois, won the H. L. Doherty prize for the best paper read before the company sections at the recent convention of the National Electric Light Association in Pasadena, Cal. The subject of Mr. Andrews' paper was "Our Job, Service." The paper was awarded first prize in the contest held by the Public Service Co. of Northern Illinois Section of the N. E. L. A. in 1919, but was not submitted for the Doherty prize that year.

Mr. Andrews' paper in part follows:

"A little logic would be an excellent thing to set us straight about this job of ours. To begin with, we are a part of a public utility organization, and the fundamental object for which the existence of any such company is justified is to render service to the public. Some may dispute this and say that the fundamental object is to pay dividends to the stockholders, but this is successfully refuted when we consider that the invested capital, with its dividend earnings, is simply one means by which the purpose of rendering service is achieved.

"Now, since each one of us is a part of our company, whose aim is useful service to the public, the deduction cannot be denied that the same aim must be ours, and what is that but another way of saying that the company's task and therefore our job is to be useful.

"Henry L. Doherty, who holds a high place in the ranks of the foremost public utility executives and financiers, says that a utility's greatest asset is good will. Is it reasonable to suppose that we can have this without service?

"The successful public utility employe must apply the test of service to whatever he does. It is to his interest, his superior's interest, and his company's interest to ask himself in all matters: Will this improve our service, create satisfaction on the part of the customer or extend our usefulness? The interests of all are alike on that question, and he who insists upon the affirmative solution in each case is the one who is the greatest success in his job, for himself, for his company, and for his ultimate employer—the public.

"No president or board of directors can show service to the public just by outlining a policy. It is our attitude and our work as meter readers, wiremen, executives, or whatever we may be, which brings in the verdict of service or dissatisfaction. It is we who have the contact with those we serve, and it is by impressions resulting from each of these contacts that the service is judged. As necessary as we have shown it to be for the corporation itself to strive for the rendering of service, it is of even greater necessity for every individual to render complete satisfaction to the public in each point of contact with them, for the former can be accomplished only by means of the latter.

"What are some of those things which make for service and some of the points in which we fail to measure up to the standard?

"Matters often come into our hands which should ordinarily be handled by another or which should have been referred to another department. When this happens, too many of us shrug our shoulders and complacently say that it is not our job and shove it aside, indifferent to the probability that it may become a breach of service to the customer. The test of service shows this attitude to be erroneous. The question of whose job it is is beside the point. If the quickest and best service will be rendered the customer through our handling of the matter, it legitimately becomes our job. We are not working for ourselves or our departments in the restrictive sense, but for our company and through it for the public.

Routine Necessary But Should Not Hamper Work.

"Promptness is a point of frequent failure in the delivery of service on the part of the utility. Much routine is necessary in a large organization and delay occasioned by this is often justified. However, an excuse should not be imposed upon and an employe who slows down because he can fall back upon red tape is an obstacle to the successful execution of our job. When a customer tells you at 4 o'clock in the afternoon that he must have his lights turned on that day, it is pretty easy to say, 'serves him right to sit in the dark for one night.' Service, however, teaches us to say, 'If there is any possible way to accommodate him we will set his meter before closing time today.'

"Public service corporations are severely criticized because of the idea harbored by many, that each has no consideration for the customer beyond that of getting his dollars. No conscientious board of directors will tolerate this principle, and any employe who believes that he is doing his company a favor by bringing in returns for which the customer has not received honest value is like a thorn in the flesh. Service demands absolute integrity between the people and the corporation on the part of the employe.

"Courtesy is a widely discussed element of our relation to the public. It has been defined as 'Politeness originating in kindliness, and exercised habitually.' This definition accurately states the attitude of those at the helm of the public service ship. Kindliness is corollary to our object of useful service to the people and, therefore, we employes can give no genuine service unless it is backed by the courtesy of kindliness.

"Retaliation is frequently our first impulse in dealing with the provoked or angry customer but does this meet the test of service? Is it politeness originating in kindliness? When the customer kicks don't kick back. Try pulling by the rope of courtesy and soon you will have him moving along the well-oiled track of service in the car of satisfaction.

ALL COMPLAINTS SHOULD BE HANDLED CAREFULLY.

"Complaints are frequently justified. Courtesy demands that we do not try to crawl out of these, in accordance with first impulses, but that we impress the customer with our desire and intention to make proper correction or adjustment. When a complaint is not justified, courtesy will convince the customer of our sincerity in rendering the best possible service. The method of courtesy tells the customer that we consider his complaint not as a disagreeable obstacle in our business, but as a measure of co-operation, and turns his dissatisfaction into an asset of goodwill.

"Public utility men are often criticized for being long on promises, but short on action. As in every other business, dependability or reliability is an essential element of service. Many demands are made upon their organizations which cannot be met, or are inconvenient to meet. In such cases it often appears the easiest to say, 'Oh, yes; we will take care of that,' and we do take care of it by pigeon-holing it in our desks. True service demands that if we say we will do a thing, we do it, and do it promptly. If we cannot do the thing put up to us, it is due the public that we come out four-square and tell them so. The blackball to our service is brought by our failure to back up our intentions and our promises with results.

"After all this has been said, does not the whole matter simmer down to a simple proposition? If we hope to be successful in our jobs as 'Public Utilitists,' we must shoulder the responsibility of our share of the job of service and take to ourselves the slogan, keep the people happy.

"Usefulness to our employer may mean that to our foremen, to our superintendents, to our board of directors, but in the final analysis, our service goes beyond any of these. We have the grandest 'boss' of all—the American Public. Our destiny is in their keeping. To those deserving by virtue of service rendered, their reward is generous. To the organization which has faithfully earned its service stripes, and through it to the individual, the public metes out success in unstinting measure. Can anyone deny that the ultimate interests of a public service corporation and its employes are identical in the attainment of success and depend upon the degree in which their avowed aim of useful service to the people is accomplished?"

COMPARISON OF POWER SALES ACTS AS TRADE INDEX.

Record of Sales to Group of Representative Industrial Power Customers Will Show Prevailing Market Conditions.

In discussing the use of graphic records of sales to groups of representative industrial power customers as an index to industrial trade conditions, H. H. Holding, of the Public Service Electric Co., Newark, N. J., points out that the day load of central-station companies serving manufacturing territories has increased to such an extent that the maximum station demand now occurs during the daytime.

The exception to this is the occurrence of a peak load during a few winter months when the daytime load is coincident with a certain part of the lighting load. This coincident use of service produces between the hours of 5 and 6 p. m. a maximum load which is commonly known as the winter peak and is of short duration, possibly not over two hours.

Continuing, Mr. Holding states that the value in kilowatts of this peak determines the station capacity in generators necessary to provide uninterrupted service. Since the normal growth of the lighting business in an industrial community is comparatively slow, the increase in the power business will determine the added capacity from year to year required for safe operation. Additional investment, therefore, on the part of the central-station company for generating, transmission and distribution equipment will be determined by the power or daytime load.

During periods when capital is difficult to obtain and extensions to the system are expensive, it is not desirable to increase capacity at a greater rate than is taken on new, profitable and permanent business. If the income from new business, for which additions are made, is at a low rate per kilowatt-hour and extensions to the system are necessary for this new business alone, very careful thought should be given to new expenditures, and the new-business department should be called upon for data to justify additions to the system.

Since the use of power on the part of the manufacturer is to a large extent determined by the quantity of his product, the demand upon the central-station company will be greater in so-called good times and abnormal under extreme conditions such as the world war brought about. Where large power customers are numbered in the thousands and the industries in the territory are of a wide diversity, it is important that increased demand upon the system be analyzed to some extent at least, in order to determine whether increase in station load is due to new business added or to a temporary increase in the demands of the manufacturers upon the system.

Mr. Holding advises the use of graphic records showing the demands of groups of consumers in territory covered by a central-station company as a means of determining the amount of equipment needed for properly handling the business and furnishing the generating capacity required of the company.

CONTRACTOR-DEALER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-keeping for the Dealer in Electrical Goods

SCHOOLS TEACH FUNDAMENTALS OF ELECTRICITY.

Young Men Given Opportunity to Study Application of Electricity to Motor Cars in Public Schools of Los Angeles.

Electricity is not only a recognized study in many of the public high schools of the United States, but some of these schools give the pupils actual experience in manual training shops connected with the schools. This is particularly

High School Electrical Float in Los Angeles Parade.

true in California where the spread of the electrical idea has inoculated even the children.

During a recent industrial parade in Los Angeles the students of electricity had an opportunity to give the public an idea of the scope of their work. Two of the high schools had electrical floats in the parade that were a credit to the industry.

Illustrated herewith is one of the floats in charge of a class in automobile electrics. With the use of work tables, tools and material they gave demonstrations of the application of electricity. Another high-school float was devoted to electric wiring. It showed an installation of a double wall board fitted up with apparatus at which a number of boys worked with a business air and their sleeves rolled up. These boys are preparing to join the ranks of contractor-dealers and electricians without the handicap of a long apprenticeship.

CROWDS ATTRACTED TO WINDOW BY ROTATING SWEEPER BRUSH.

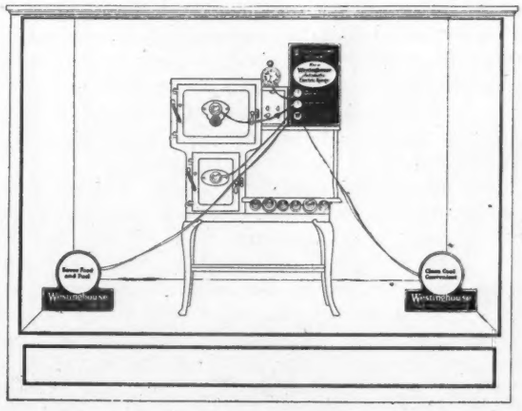
In one of the minor business streets of Milwaukee is a small electrical store with a show window fronting about 14 ft. on the sidewalk. Recently a large crowd of people was observed in front of this window gazing intently at something in the midst of the display which included a washing machine, an ironer and several vacuum cleaners. The crowd was so large that those in the rear could not see what the attraction was and some were trying to push their way nearer the window. But those in front did not give way until they had apparently studied every feature of the display.

The cause of this gathering was the innocent motion of a floor brush in a vacuum cleaner, the only sign of life in the entire display. The cleaner had been placed flat on the floor of the window with the nozzle upward and near the glass. The cord had been connected with a plug inside the store and the little floor brush could be seen revolving as it would if applied to a floor. That was all, but it was sufficient to attract many people who, after watching the revolving brush for a while, stayed to read every showcard and look over every appliance in the window. That is what the dealer put it there for, and it was fulfilling its mission well. Inside the store the dealer and two salesmen were busy with more customers than they could handle.

FEATURING AUTOMATIC ELECTRIC RANGES IN SHOW WINDOWS.

Display Shows How Housekeeper May Set an Alarm Clock and Return From Shopping Tour to Find Dinner Cooked.

For the purpose of assisting contractor-dealers to sell the idea of automatic cooking one manufacturer of electric ranges is supplying among other dealer "helps" a design for a window display similar to the illustration herewith. The



Design for Window Display of Automatic Electric Range.

display consists solely of an electric range and three show cards that emphasize the special features of the range.

The idea of this window display is to present to the observer in as forcible manner as possible the benefits to be derived from the employment of a range with an attachment which permits the housekeeper to go out shopping or calling while food is being automatically cooked.

Business Hints for the Dealer

Personality and Its Success in Salesmanship—Domineering Type of Salesman—Cringing Servility a Poor Sales Element

Electrical dealers, called upon in the last year or two to face many problems in their rapidly expanding merchandising field, are taking a keener interest in the question of salesmanship. They are finding it a broad question in its application to electrical appliances. They are making a closer study of selling from the buyer's point of view, and in so doing are learning that the old selling policy of "let the buyer beware" must be discarded in favor of fair facts and honest fellowship if they hope to establish a sound business on a solid basis of public confidence and substantial growth.

When the discussion of sales personality comes up among salesmen there is increased emphasis given to the success of the "man with the facts." From the days of the salesman with the liveliest stories and a "slush" fund to take care of large entertainment expenses, the development is now in the direction of ability to impart the latest and most accurate information concerning business. Business is no longer just "good"; what goes to make up its goodness must be explained. Therefore, the quiet-spoken salesman who is neither domineering nor full of flattery, but knows everything there is to know about his lines of business, is the man who can lay claim to a very agreeable personality. And this is true of the salesman behind the counter and on the demonstrating floor as well as the salesman traveling for the jobber or manufacturer.

Personality an Important Factor in Salesmanship.

Worthy merchandise, attractive prices and advertising may all play important parts in selling goods, but as long as the buyers are human it is to be expected that the personality of the salesman will continue to exert a very pronounced influence in merchandising. More than one failure to qualify as a successful salesman, even with merchandise that came close to selling itself, has been credited to lack of personality.

One successful contractor-dealer defines personality in the selling of electrical appliances as that quality in a salesman that guides him to first learn his goods thoroughly—how they are made and operated to the best advantage—then tell the facts to his customer just as he would like to have them presented to him if he was the customer in search for the best for his money. The same contractor-dealer says that lack of that human quality called personality is often represented by the man who, despite ample opportunity to watch and learn selling methods from some of the most successful salesmen, absorbs his ideas much as some children do a school lesson. He writes out a sales talk and learns it by rote, repeating the same talk in the same strain to each customer much as a stereotype repeats the same print or a phonographic record reproduces the same tune.

"Rubber-stamp" salesmanship is described as that kind that fails to recognize the different personalities in the various customers and meet like with like. That kind of a salesman, to use a baseball expression, "has no change of pace." In golf there is a similar idiom to the effect that "all shots cannot be made with a driver." Personality in salesmanship is a large subject, experts declare, because it admits of so many variations. The variations are there because there are so many types of buyers. Summed up, however, men of long experience in the selling business believe they have formulated a general rule when they explain that the sales talk must fit the type of buyer addressed. Emphasis is laid upon the "change of pace" idea, and just as the pitcher in a ball game studies the batter, so the salesman must study his prospective customer.

Domineering Type of Salesman May Overplay His Part.

The domineering type of salesman has usually been the idol of his class. It takes only the breath of suggestion to lead him to telling his most recent experience in making a buyer "hop through the hoop." Veterans in the profession are apt, however, to call attention to the fact that while the "nervy" member can relate quite a few instances of the sort, some inquiry will point to quite a number of cases where bluff and domineering got the same salesman nothing. In fact, to establish a reputation as a browbeater the salesman is apt to overplay his part and get into more hot water than he can comfortably stand.

An interesting sidelight to the subject of salesmanship at present is the condition brought about through the long continued reign of a sellers' market. That condition, it seems, has done more to encourage the domineering type of salesman than any other factor. Circumstances made it possible for the salesman to dictate to the buyers in a manner never before presented. Not a few of them took full advantage of this new power and, no doubt, deceived themselves into believing it was their strong personality that was winning instead of the dictation of conditions. On the other hand, there are many instances related by salesmen who admit they will never talk to buyers again the way they did when goods were scarce and customers had to take what they could get or go without.

In one large house the policy laid down for the season when goods were scarce and prices constantly advancing was to have customers distribute their purchases over the entire line. That is, the buyer could order only a small percentage of the lower-priced merchandise, but to get it he had also to purchase goods of a higher price. Of course, many of the customers objected and not a few of them left the showroom with the threat of transferring their business elsewhere. The salesmen for this house fully realized the condition of the market and the "take it or leave

it" attitude received full expression. With the situation reversed there has been a decided "change of pace" and the salesmen are well aware of the fact that the days of domineering are over.

SUBSERVIENCY SOMETIMES SELLS GOODS WHEN OTHER METHODS FAIL.

While browbeating tactics may be generally condemned there are occasions when that method may be judiciously used. A subservient manner, on the other hand, is not well recommended. It has very few supporters, if any, among the salesmen who lead in their profession. Sales diplomacy gets the largest share of credit of any attribute of personality but a sharp dividing line is drawn between diplomacy and the attitude termed "bootlicking," meaning a low degree of cringing subserviency. One salesman who has an excellent record of achievement says:

"'Bootlicking' gets many deals through because it is human nature for a buyer to relish holding the whip hand. But with sales made in that way the element of respect is totally lacking. The man who makes it his business to say nice things to a customer has to keep busy thinking up new compliments and new ways to make himself more humble. There is nothing quite so tiresome to the average buyer as honeyed words after a time, and it might surprise the salesman who makes constant use of them to know how well an independent and outspoken rival is getting along with the same customer.

"Take the contractor-dealer who attends to the buying from jobbers' salesmen. It's when that dealer is thinking of making a change in the placing of his business that the jobbers' salesman who is always dealing in soft platitudes has to be afraid. The buyer for the electrical store doesn't care a whit what his flatterer thinks of him. Down in his heart he believes most of the compliments he received from the fellow were pure 'bunk.' He has some respect, however, for the opinion of the salesman who talks right up to him, and he is not so prone to offend him. That is where the free speaker who talks common sense and presents his sales arguments clearly and helpfully has the advantage."

DRESSING UP A DISPLAY ROOM TO APPEAR LIKE HOME.

Contractor-Dealer With Small Store May Increase His Business by Installing Display Room for Household Appliances.

Judging from the growth of the household electrical appliance business during the past two years it will not be very long before contractor-dealer stores will be as large as small department stores. When that time arrives they will be able to afford space in which to furnish up display rooms representing a parlor, diningroom, kitchen, bedroom or laundry. They will have in each room the appliances and fixtures serviceable for that room, all connected up and ready for demonstration. It is being done now in some of the large appliance stores of central-station companies.

Until the time comes, and dealers increase the size of stores, space in the small store may be partitioned off and fitted up as near as possible like a room at home. Decorations and electrical fixtures and appliances for a diningroom may be installed and demonstrated for one or two weeks or longer. Then a change may be made to a kitchen for another period, followed by the other rooms. Advertisements in local newspapers, signs in the windows and the mailing lists may be used to announce the "Appliances for the diningroom....." campaign, or for which room is arranged for the period.

Through co-operative efforts of the electrical industry in California the contractor-dealers of that state are now enjoying the benefits of a number of model electrical homes. The chief idea of the California plan is to induce the public to install more convenience outlets, but the visitors are more impressed with the necessity for additional outlets by the presence in each room of the model home of the proper electrical appliances.

LENDING A NEW APPLIANCE DURING REPAIR OF OLD ONE.

System that Multiplies Sales of Flatirons for Electrical Dealer Who Also Makes Success of Special Appliance Campaigns.

"It will take a little time to make a good job of this, and we would be glad to have you take this new flatiron home and finish your work while we are repairing your old one," says Wm. H. Hetzell, who recently opened a new electrical store in Racine, Wis., to a customer.

The housewife had hurried into the Hetzell store with her old flatiron which had "gone wrong" in the midst of a busy ironing day. She hoped the repairs could be quickly made so she could take it back with her. But the appliance was in poor condition, and Mr. Hetzell had quite a number of rush repairs ahead of this one. So he took a latest model flatiron from his stock and invited the woman to use it free of charge until the repairs were made—it might be several days before it could be delivered.

Of course the new flatiron, equipped with a new cord, has a better appearance than the old one. In many instances the housewife purchases it and discards the old one. When she does not do so at once, she remembers its good qualities —and the generosity of the dealer who let her use it until her own was repaired—and the sale is closed later. The woman also mentions the circumstance to her neighbors with beneficial results to the dealer.

Mr. Hetzell specializes in contractors' supplies. He has not as yet plunged heavily into the merchandising business. But he does conduct an excellent repair department, and he has a neat, business-like show window which he dresses effectively. He also conducts an occasional special campaign. Not long ago he closed a successful washing-machine campaign and, after an interval, began a campaign for the sale of vacuum cleaners. While his average daily sales are not very large, Mr. Hetzell says the campaigns are advertising his business and bringing many new customers to his place of business for repairs and other appliances.

NEW APPLIANCES

Newly Developed and Improved Electrical and Mechanical Apparatus, Appliances, and Devices Now Being Placed on the Market

Flashlight With Hand-Operated Generator.

A flashlight in which a small generator replaces the usual battery has found its way into the American market. The generator is operated by repeated clamping of a handle attached

Hand-Generating Flashlight.

to the aluminum tube containing the moving parts.

As the handle is compressed toward the tube a ratchet is caused to drive a pinion which connects through a multiplying gear with the armature. The multiplication is sufficient to produce a brilliant light when the lever is clamped with ordinary dexterity. A more deliberate movement of the lever results in a less brilliant light. Continuous motion of the lever is not necessary because the inertia of the armature is sufficient to propel it for several seconds after a quick compression of the lever. The armature is concentric in the tube and is surrounded by the magnet. The capacity is 1.5 amperes at 3 volts.

The lamp is separable into four sections by unscrewing the aluminum frame. These sections are composed of the rear-end cap, the armature section, the lamp section and the front or lens section. Standard flashlight lamps are employed. The length over all is 4.5 ins., and the maximum diameter is 2.25 ins. This lamp is the product of a Swiss concern and is being introduced in America by Elsaesser & Field, Flatiron building, New York City. It is the intention to manufacture the lamps in America as soon as arrangements can be effected.

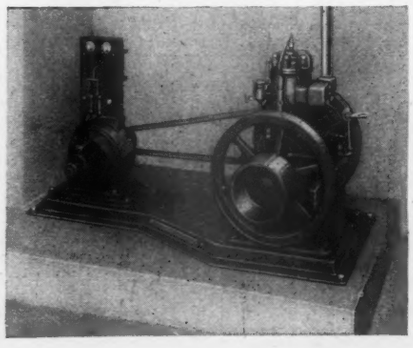
Industrial Lighting Unit.

An industrial lighting unit designed both for wide distribution and for concentration of light has been developed by the Perfection Co., New York City. This unit consists of two shades, the upper one being opaque and the lower one translucent. The lower shade sends the light downward, and the upper shade produces a general distribution covering the space under the unit and at the sides.

Belt-Driven Lighting Plant.

One of the features of the lighting set shown in the accompanying illustration is the second pulley on the engine shaft. This second pulley is provided to make the set suitable for the generation and use of mechanical as well as electrical power. The engine, which has a rated capacity of 4 hp., may be operated with gasoline, kerosene. crude oil or natural gas. The generator, which is made by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., and has a capacity of 1 kw., is wound for 40 volts and is provided with a sliding base to allow for proper adjustment. A panel with voltmeter, ammeter, rheostat, fused line switch, starting switch, stopping switch and reverse-current relay controls the entire unit and a 16-cell 107-ampere-hour battery of the glass-jar. lead-plate type is provided to supply service when the engine is not running.

The unit is started by pushing on the starting button mounted on the lower right-hand side of the panel. This connects the battery to the generator, causing it to operate as a motor and crank the engine. Pushing on the button in the lower left-hand corner of the panel stops the unit by breaking the ignition circuit. The rheostat controls the battery voltage, and the double-pole fused switch in the center of the panel is used to connect the generating unit with the light and power line. A relay, mounted on the rear of the panel,



Lighting Plant with an Extra Pulley on the Engine Shaft.

automatically keeps the battery from discharging through the generator when the generator is not running, and also automatically connects the generator to the battery when the generator voltage is sufficiently high. This outfit is being marketed by the Chambers Manufacturing Co., Butler, Pa.

Convertible Caps for Separable Attachment Plugs.

In line with the demand for, and trend toward, standardization of attachment plugs is the announcement of a convertible cap for separable attachment plugs recently placed on the market by the Benjamin Electric Manufacturing Co., 120 South Sangamon street,

Benjamin "Convert-a-Cap" for Separable Plugs.

Chicago. This cap is designed to fit the slotted openings of the various forms of wall receptacles known as parallel, tandem, double-T and I-T.

The new device, known as the "Convert-a-cap," can be converted to fit any of the three types of receptacles, parallel, tandem and T, the conversion being made without the use of tools.

Squirrel-Cage Induction Motor With Riveted Frame.

A ball-bearing type of polyphase induction motor having a riveted frame is being marketed by the Cleveland Electric Motor Co., Cleveland. Motors are made for both 25 and 60-cycle service and for standard voltages. Rotor bars are connected mechanically and electrically by a special process in which the short-circuiting rings are welded to the bars. Standard ball bearings are used, and the terminals come out through a board mounted on the motor frame.

Rust-Proof Compound.

For the temporary protection of iron or steel parts from weather and rusting, the Conversion Products Corp., New York City, has developed a compound known as "Stazon." This material has a petroleum base, is an insulator and a lubricant, and does not flow at a temperature under 200 deg. F. It is particularly suitable for protecting bearings, shafts and other similar parts during transportation and storage.

ACTIVITIES IN THE TRADE

Business Developments, Sales Agencies, Trade Literature and Miscellaneous Items Concerning Electrical Manufacturers and Allied Business Interests

John J. Leahy Electrical Supply Co., 48 Dey street, New York City, has leased the five-story building adjoining its present plant, for a term of years. The building is 25 by 100 ft.

Killark Electric Manufaturing Co., St. Louis, has issued a small folder in which the difference between Killark safety fuses and renewable fuses is discussed by Louis Desloge, vice-president of the company

Cutler-Hammer Manufacturing Co., Milwaukee, has issued an illustrated leaflet, describing the metal melting pots, both portable and bench types, manufactured by the company. The leaflet is known as publication No. 826.

Pittsburgh Electric & Manufacturing Co., Pittsburgh, Pa., has acquired property in the vicinity of its plant on Lexington avenue, between Meade street and Penn avenue, 89 by 440 ft., for the erection of an addition to its plant.

O'Brien Storage Battery Co., 87 Halsey street, Newark, N. J., has filed notice of organization to manufacture storage batteries, and operate a general repair works for electrical service. David O'Brien, 82 Chambers street, East Orange, N. J., heads the company.

Westinghouse Lamp Co., 165 Broadway, New York City, has purchased for the future expansion of its Watessing branch a tract of land on Bloomfield, N. J., comprising a total of 2.6 acres. The plot purchased is across the street from the site of the present plant.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has recently announced the forming of a new section of the supply department at Newark, N. J., to be known as the fan motor section, which will handle the fan motor commercial work. W. J. Jockers, formerly of the New York City office, has been appointed manager of the section.

Illinois Electric Porcelain Co., Macomb, Ill., has about completed additions to its plant that will increase its production capacity 30%. The additions consist of a porcelain testing department, 72 by 84 ft.; a new sagger department, 50 by 96 ft.; addition to kiln room, 70 by 72 ft., and an addition to warehouse, 76 by 175 ft., all these additions being one-story buildings. An addition to the office, 16 by 30 ft., is also being built.

Altofer Bros. Co., Peoria Ill., manufacturer of power and electric washing machinery, has opened a branch office in the Bush Terminal building, New York City, and has also established warehouse facilities in that city. Walter L. Williams is in charge of the New York City office and will be assisted by Harry A. Bell and W. L. Patterson. The office will have charge of sales in the territory east of the Ohio-Pennsylvania line and north of the Virginia-Carolina line.

Baltimore Electric Supply Co., Baltimore, has filed plans or improvements and extensions in its plant at 331 North Calvert street.

Penn. Electric Construction Co., Scranton, Pa., has taken possession of several large buildings recently occupied by a baking company and will use them as a storage and distribution plant for the Westinghouse Electric & Manufacturing Co. products handled by the company.

Nissen & Crane, Chicago, patent attorneys, have succeeded the former firm of Brown and Nissen, which was dissolved on Feb. 17, last, by the death of Frank T. Brown. The new firm consists of Charles M. Nissen and Alpheus J. Crane and has offices at suite 1124 Monadnock building.

Uehling Instrument Co., 71 Broadway, New York City, will exhibit the fuel-saving devices manufactured by the company at two of the leading expositions this year, namely, the Chemical Industries show at Grand Central Palace, New York City, Sept. 20-25, and the National Association of Stationary Engineers convention at Milwaukee, Sept. 13-17. The company is impelled to do this in view of the fuel shortage and the unusual public interest in devices that make possible economical use of fuel. The principal products of the company to be shown will be the new "Style U" CO_2 recording equipment.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has issued leaflets which describe and illustrate its line of oil circuit-breakers. Both the application and distinctive features of these circuit-breakers are discussed. Each leaflet contains a table, giving an outline of maximum current, voltage and interrupting capacity ratings of the circuit-breakers listed therein. The types described are: C, CG, Co-1, CO-2, E-6, E-7, E-8, E-9, O-1, O-2, B-a, B-2, B-13, G-1, G-11, G-A and G-2. This list includes circuit-breakers with voltages as high as 25,000 and rated as high as 23,000 amperes. They are for indoor service, either manually or electrically operated, full automatic, non-automatic or single throw.

Norwalk Electric Works, State street, South Norwalk, Conn., is having plans prepared for the erection of a two-story plant to cost about $40,000.

Thomas A. Edison, Inc., West Orange, N. J., is having plans prepared or the erection of a one-story addition to the power house at its electrical plant.

Eastern Pennsylvania Bake-Rite Co,. Philadelphia, manufacturer of insulating materials, has leased property at 71 Ranstead street, aggregating 10,000 sq. ft., for a new local works.

Holtzer-Cabot Electric Co., Armory street, Roxbury, Mass., manufacturer of electric motors, generators, etc., has awarded a contract for the erection of a one-story addition, 26 by 78 ft.

Union Electric Manufacturing Co., Milwaukee, is sending out leaflet bulletins describing the various types of controllers, motors and accessories manufactured by the company. The bulletins also give the list prices on the various articles.

General Electric Co., Schenectady, New York, is sending to the trade a bronze paper weight, consisting of a standard separable attaching plug on a pedestal. On the pedestal is inscribed the slogan "Keep Plugging to Standardize," in line with the campaign to obtain standardization in plugs.

Apex Electrical Distributing Co., Cleveland, held its annual convention of sales managers, distributors and others connected with the sale of "Apex" electric suction cleaners, at the Hollenden Hotel, Cleveland, July 13-15, with 68 representatives present. At the convention new sales methods were outlined and progressive business methods unfolded by which the Apex company intends to make even greater progress during the next 12 months than in the year just passed. A friendly competition was evolved during the sessions when the company production executives issued a challenge to the salesmen to sell the cleaners as fast as the factory can manufacture them. The salesmen at once accepted the challenge and the contest is now in progress.

Sales Managers and Distributors of Apex Electrical Distributing Co. at Dinner Held in Cleveland, July 13-15.

PERSONAL MENTION

Biographical Sketches and Chronicle of Changes in Business Connections, Promotions and Other Personal News of the Industry

E. T. STOTESBURY, Philadelphia, chairman of the board of directors of the Philadelphia Rapid Transit Co., has resigned.

H. BOYD BRYDON, mechanical engineer of the Byllesby Engineering & Management Corp., has been appointed a member of the prime movers committee of the National Electric Light Association.

WILLIAM C. BRIGGS, formerly sales engineer and New York City manager of the Shepard Electric Crane & Hoist Co., has become vice-president in charge of manufacturing of the Franklin Moore Co., Winsted, Conn.

CHARLES G. BARRETT, formerly sales engineer of the marine department of the Fairbanks, Morse Co. New York City office, has become associated with the Blake & Knowles Works of the Worthington Pump & Machinery Corp., East Cambridge, Mass.

DR. ALPHONSE A. ADLER, for ten years professor in charge of machine and power plant design at the Polytechnic Institute of Brooklyn, N. Y., has resigned to enable him to give his undivided attention to his consulting practice in New York City.

KARL R. KENNISON, formerly plant engineer of the Emergency Fleet Corp., in charge of shipyard and drydock construction at New Orleans, La., Mobile, Ala., and Pensacola, Fla., has opened an office as a power-plant engineer at 18 Tremont street, Boston.

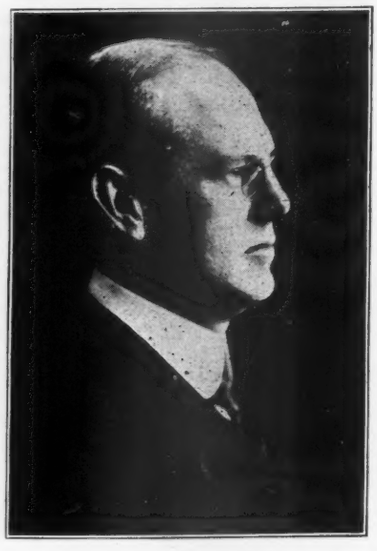
STEPHEN E. PREBLE, for many years associated with the I. W. Jones Co., engineer, Milton, N. H., has been elected vice-president and general manager of the Industrial Planning Corp., Buffalo, N. Y., which specializes in hydroelectric development and the design of pulp, paper and fiber mills.

LESLEY C. PAUL, formerly editorial representative of the *Electric Railway Journal*, is now connected with the publicity department of the Westinghouse Electric & Manufacturing Co. as technical editor in charge of railway publicity. He is a graduate of the engineering course of the University of Colorado, finishing his course in 1915.

FRED E. WELLS, Boston, has been elected treasurer of the Federal Corp., Westfield, Mass., manufacturer of electric specialties, to succeed C. W. Dodson, who recently resigned the position. F. R. Speed, Springfield, Mass., formerly connected with the Packard Motor Car Co., has been made vice-president in charge of manufacturing and production of the corporation.

A. E. ROBERTS has been elected first vice-president of the Milliken Brothers Manufacturing Co., New York City, manufacturer of standardized all-steel buildings for industrial and electric service, steel transmission towers, radio towers, etc. Mr. Roberts was formerly vice-president and general manager of the Hedden Iron Construction Co., Newark, N. J. He will be in charge at the New York City office, and direct all matters pertaining to sales and policies.

DR. ERNEST FOX NICHOLS, formerly president of Dartmouth College, and more recently professor of physics at Yale University, New Haven, Conn., has accepted a position as director of pure science at the Laboratory of Pure Science, Nela Research Laboratories, Nela Park, Cleveland, O. The research laboratory was organized in 1908 under the directorship of Dr. Edward P. Hyde, as the Physical Laboratory of the National Electric Lamp Association. The name was changed to Nela Research Laboratory in 1913, when the National Electric Lamp Association became the National Lamp Works of General Electric Co. For some years the laboratory was devoted exclusively to the development of those sciences on which the art of lighting has its foundation, but in 1914 the functions of the laboratory were extended by the addition of a small section of applied science, which had an immediate practical objective. The section of applied science is now being largely extended as a separate Laboratory of Applied Science under the immediate direction of M. Luckiesh, who becomes director of applied science. A new building is being constructed to house this branch of the work, which will be carried forward with a staff of several physicists, an engineer, an architect and a designer, together with the necessary technical and clerical assistants. The Laboratory of Pure Science and the Laboratory of Applied Science will together constitute the Nela Research Laboratory, and will be co-ordinated under the general direction of Dr. Hyde, who becomes director of research.



Dr. Ernest Fox Nichols.

W. DE L. CARR has been appointed superintendent of the Northern Indiana Gas & Electric Co. Mr. Carr was formerly connected with utility companies in Philadelphia.

A. A. DION, general manager of the Ottawa (Ont.) Electric Co., has been elected a member of the engineering section of the National Safety Council of the United States.

FRANK HARVEY GALE, advertising manager of the General Electric Co., Schenectady, N. Y., was married on Aug. 4 to Miss Sadie Woodbury Martin, the wedding taking place at Lynn, Mass. The newly-married couple will make their home at 4 Lowell road, Schenectady.

FRANKLIN T. GRIFFITH, president of the Portland (Ore.) Railway Light & Power Co., and Guy W. Talbot, president of the Pacific Power & Light Co., Portland, Ore., were in Washington, D. C., recently attending a conference of the National Water Power Commission, consisting of the Secretary of War, the Secretary of the Interior and the Secretary of Agriculture. Messrs. Griffith and Talbot represented the water-power development committee of the National Electric Light Association at the Washington conference.

G. W. CANNEY, formerly service manager of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has been transferred to the office of W. K. Dunlap, assistant to vice-president. Other changes are as follows: L. C. Richards, formerly district service manager at New York City, has been made electrical manager in charge of service department work in connection with all electrical apparatus, including service shops; A. D. Hunt, of the South Philadelphia works, has been made steam service manager in charge of service department work in connection with all steam apparatus; W. H. Keller has been made office service manager at East Pittsburgh in charge of all clerical, cost and accounting details of the service department.

OBITUARY.

COL. CHARLES J. BILLS, for 16 years an executive of the Lincoln Telephone & Telegraph Co., died recently at his home, Lincoln, Neb.

CHARLES S. GLEED, a director of the Southwestern Bell Telephone Co., died recently at his home, Topeka, Kan. Mr. Gleed was part owner of the *Kansas Journal* and was a director of the Atchison, Topeka and Santa Fe Railroad.

EDWARD KENT, assistant treasurer of the Halcomb Steel Co., Syracuse, N. Y., died July 24, following an attack of pneumonia. Mr. Kent was 73 years of age and was born in England, coming to Syracuse at the age of 14 years. He joined the Halcomb company forces 20 years ago.

BUSINESS OPPORTUNITIES

News of Electrical Construction Projects in All Parts of the Country, Proposals Invited, Foreign Trade Openings and New Companies

EASTERN STATES.

Nashua, N. H.—The Nashua Manufacturing Co. has completed plans for extensions and improvements in its power house.

Cambridge, Mass.—Plans have been prepared for a power house for factory service at the plant of the A. R. Hyde Co., 432 Columbia street. The structure will be 20 by 40 ft.

Charleston, Mass.—Plans have been completed by Palmer & Parker Co., 103 Medford street, for a power house at its factory to cost about $15,000.

Chelsea, Mass.—The board of trustees of the Soldiers' home is having plans prepared or extensions and improvements in the power plant at the institution to cost about $125,000, including new equipment. Harrison H. Atwood, 61 Alban street, Boston, is the architect in charge of the project.

Pawtucket, R. I.—The Tubular Woven Fabric Co. will make an extensive electrical installation at its mill, to include a total of 38 motors, ranging from 2 to 25 hp.; new transformers; new lighting arrangement, and installation of additional lamps; wiring, etc. The present voltage will be changed from 220 to 550 volts.

Phillipsdale, R. I.—The American Electrical Works has completed plans for a transformer station at its plant, one-story and basement, 15 by 40 ft.

Hartford, Conn.—The Southern New England Telephone Co. is completing the erection of a new building on Pearl street.

New Britain, Conn.—The Hart & Hutchinson Co. will build a power plant at its metal-working plant, in connection with the erection of a factory addition. The construction contract has been let to the Collins-Lotz Co., Hartford, Conn.

Buffalo, N. Y.—The State Hospital Commission, Albany, E. S. Elwood, secretary, has completed plans for electrical work at the Buffalo State Hospital, including conduits, wiring, etc. Bids have been asked.

Buffalo, N. Y.—Electrical and mechanical equipment will be installed in the plant of the Drumstra Ice Cream Co., 958 Fillmore avenue, to be located at Bailey avenue and Broadway. The factory is estimated to cost about $75,000.

Buffalo, N. Y.—The New York Telephone Co. has had plans prepared for the erection of a one-story addition to its Oxford exchange, 30 by 60 ft., to cost about $20,000.

Mariners Harbor, S. I., N. Y.—The Proctor & Gamble Co., Port Ivory, has filed plans or extensions and improvements at the power house of its local soap works.

New York, N. Y.—The Globe Storage Warehouse & Carpet Cleaning Co., 305 East 65th street, has closed down its private power plant and entered into contract with the New York Edison Co. for service. The installation includes both light and power.

New York, N. Y.—The Exide Battery Depots, Inc., 101 West End avenue, has awarded a contract to the William Steele & Sons Co., 16th and Arch streets, Philadelphia, for the erection of a two-story service works at Spring and Clark streets, estimated to cost about $250,000, including equipment.

New York, N. Y.—The American Telephone & Telegraph Co., Bell system, reports a total of 308,000 instruments added to its lines in different parts of the country since January 1. At the present time, unfilled orders total 200,000 requests for telephone service in excess of normal.

New York, N. Y.—The Commercial Cable Co. and other Mackey utility interests has admitted the jurisdiction of the Interstate Commerce Commission. The commission has issued an order of date of August 2, assuming supervision, and has ordered the companies to file annual reports, dating from 1917.

New York, N. Y.—The New York Telephone Co. has acquired property at 226 West 36th street, comprising a four-story building, and two adjoining three-story buildings. The site will be used at a later date for the erection of a large addition to the company's exchange plant in this vicinity. Plans have been filed for the erection of a new three-story central station at 444 St. Marks place, Richmond, to cost about $67,000. A permit has also been taken out for extensions and alterations in the exchange building at 16 Snyder avenue, Brooklyn, to cost about $60,000.

New York, N. Y.—Foundation work has been completed for the new substation and transformer house for the New York Edison Co., Irving place and 15th street, at 421 East Sixth street. The structure will be four-stories high, and with equipment is estimated to cost $350,000.

New York, N. Y.—The New York Telephone Co. has filed a schedule of increased rates with the State Public Service Commission to apply to territory outside of New York City, and affecting about 200 cities, towns and villages in the state. The increased rates vary from 20 to 30%, the first noted being a minimum.

New York, N. Y.—Electrical and mechanical equipment will be installed in the addition to the plant of the Carolyn Laundry, 104 East 126th street. The company has acquired adjoining buildings, and these will be remodeled and improved to accomodate the new business. The purchase consideration is stated to be about $300,000.

Rosendale, N. Y.—Charles P. Dickenson will build an electric light plant in the town of Ulster, Delaware county, and will construct a transmission line to furnish electric light and power to Rosendale.

Atlantic City, N. J.—Electrical and mechanical equipment will be installed in the sewerage disposal plant, to be constructed in the uptown district by the Atlantic City Sewerage Co., Guarantee Trust building. Clyde Potts, 30 Church street, New York City is the engineer in charge of the project.

Butler, N. J.—The borough council has approved an increase in appropriation from $55,000 to $75,000 for proposed extensions and improvements in the municipal electric power plant. Bids for the work were recently asked. The council is arranging for the purchase of property adjoining the plant for the addition.

Hackensack, N. J.—The building committee of the Hackensack General Hospital, Third avenue, has completed plans for the erection of a one-story power plant at the institution to cost about $40,000. Crow, Lewis & Wick, 200 Fifth avenue, New York City, are the architects for the project.

Highstown, N. J.—The State Public Service Commission has granted permission to the Hightstown Electric Light & Power Co. to increase its light and power rates. The change provides for a minimum charge of $1.50 for commercial meter lighting, instead of $1, as heretofore, and a minimum charge of $3 per hp. of motor installed, instead of the former rate of 50 cts. The present base rates of 10 cts. per kw-hr. for power, and 15 cts. per kw-hr. for meter lighting are maintained.

East Orange, N. J.—In connection with a new contract to be made with the Public Service Corporation of New Jersey for street lighting, the lighting committee of the city council is negotiating with the company for the replacing of present gas lamps with improved electric lamps. It is proposed to arrange the change in certain sections, one to follow another, until the complete change has been made.

Newark, N. J.—The Public Service Railway Co. has received permission from the State Board of Public Utility Commissioners to issue trust certificates for $1,820,000, and enter into an agreement with the Osgood Bradley Car Co., Worcester, Mass., for the purchase of new equipment to this amount. The order will include 200 one-man safety cars; 100 center and end exit trailer cars; 15 double-truck snow plows: and 15 standard sweepers. The board has also granted the company permission to issue notes to the amount of $410,000, the proceeds to be used in part for proposed extensions and betterments.

Allentown, Pa.—The city council

has authorized Thomas Roth, head of the water department, to prepare plans and specifications for electrically operated pumping machinery at the municipal waterworks, with general extensions and improvements in the plant to cost about $60,000. The installation will comprise a centrifugal pump of about 12,000,000 gals. capacity; a three-stage, 7,000,000-gal. pump, and a 750-hp. steam turbine, with reduction gears, motors, etc.

Bloomsburg, Pa.—Judge Harman, Columbia County Court, has authorized the sale of the property of the Columbia & Montour Electric Railway Co., totaling about 16 mi. of line, which has been in receivership for about five years past. The line extends through Bloomburg, Espy, Catawissa and Berwick. A. W. Duy is the receiver of the company.

Centralia, Pa.—The Schuylkill Electric Co., Girardville, has discontinued local service, covering municipal street lighting and power supply, owing to the inability of the borough to defray the cost.

Dillsburg, Pa.—The Dillsburg Light, Heat & Power Co. has filed notice of increase in capital stock to $40,000 for proposed expansion.

Hudsonville, Pa.—The Wyoming Valley Water Co. has commenced the construction of a power line from a point near Drifton to Eckley and Buck Mountain, for industrial service in this section.

Kingston, Pa.—The Luzerne County Gas & Electric Co. has made application to the State Public Service Commission for permission to issue bonds for $1,150,000 and stock for $300,000, for extensions, improvements, etc.

Kittanning, Pa.—The power house at the plant of the Kittanning Brick & Fire Clay Co. was destroyed by fire, August 3, with loss estimated at $50,000. It is said that the plant will be rebuilt at once.

Oil City, Pa.—The Citizens' Traction Co. has applied to the State Public Service Commission for permission to issue bonds for $59,000, the proceeds to be used for proposed extensions and betterments.

Philadelphia, Pa.—Bids are being taken by the Ferguson Carpet Co., Stenton and Rockland streets, for the erection of a power plant, 40 by 75 ft., at its factory.

Philadelphia, Pa.—The department of public works is planning for improvements and extensions in its Queen Lane pumping station and Lardner's Point pumping station, used for the waterworks department, to cost about $250,000. The work will include the installation of electrically operated pumping machinery and auxiliary apparatus.

Philadelphia, Pa. — Construction work is under way on a power plant at the belting factory of the L. H. Gilmer Co., Keystone and Cottman streets, to be used for general works service. The structure, in connection with a new factory addition, will cost about $70,000.

Philadelphia, Pa.—The Philadelphia & eRading Railway Co. has awarded a contract to Charles C. Pace, Montgomery avenue, Cynwyd, Pa., for the erection of an electric substation on Arch street, to cost about $12,000, exclusive of equipment.

Pittsburgh, Pa.—The J. K. Davidson Sand Co. is arranging the installation of considerable electric machinery on a new sand digger to be constructed at one of the local yards. Sand and gravel screens, and other apparatus will be electrically operated.

Pittsburgh, Pa.—The Goodman Manufacturing Co., 48th place and Halsted street, Chicago, manufacturer of electric mine locomotives, and kindred equipment, has leased a four-story building at 216 Penn aveune, Pittsburgh, comprising about 18,000 sq. ft. of space, for the establishment of a branch repair and supply works.

York Haven, Pa.—The York Haven Water & Power Co. is acquiring property in the vicinity of its hydro-electric power plant at Goldsboro, for proposed enlargements. It is planned to increase the present generating capacity.

Baltimore, Md.—The Chesapeake & Potomac Telephone Co. has broken ground for the erection of an exchange plant on Kate avenue, to cost about $100,000.

Baltimore, Md.—The tallest stack in the state will be erected by the Columbia Graphophone Co. at its power plant in the Orangeville district, in connection with a large manufacturing plant here. The structure will be reinforced concrete, with 18 ft. base, and will be 230 ft. high. It is estimated to cost $12,500.

Baltimore, Md.—The Consolidated Gas, Electric Light & Power Co. is planning for the erection of an addition to its plant on Monument street. The company is reported to be securing considerable property in this district for the enlargement. The company will build an addition, 52 by 200 ft. to its electric substation at Race and Barney streets. The report filed by the company with the State Public Service Commission shows net earnings of the electric department during the past six months of $255,-874.85, and of the gas department, $152,585.20. The surplus available for dividends, reserves, etc., is $259,454.61, depreciation not included.

Hagerstown, Md.—A petition has been presented to the Hagerstown & Frederick Railway Co., by the Chamber of Commerce, backed by local citizens in large number, for the extension to its line from Hagerstown to Security.

Fort Myer, Va.—The U. S. Army Ordnance Department, Washington, is planning for the erection of a power plant.

Fredericksburg, Va.—The local power plant of the U. S. Army Ordnance Department was recently partially destroyed by fire, caused by lightning.

Rosslyn, Va.—Fire, July 31, destroyed the engine plant and partially destroyed the power house at the plant of the Rosslyn Packing Co.

Charlotte, N. C.—The Southern Public Utilities Co. is planning for extensions and improvements in its electric power plant and system, to cost about $150,000.

Moncure, N. C.—The Moncure Manufacturing Co. will develop water power on Deep river and will furnish electric power to Moncure, Pittsboro and other towns.

Greensboro, Ga.—The city council is planning for extensions in the local street lighting system, to cost about $10,000.

Savannah, Ga.—The Southern Bell Telephone & Telegraph Co., Atlanta, Ga., is planning for the erection of a local exchange plant.

Miami, Fla.—The Bay View Estate Corp. will build an electric light and power plant.

Miami, Fla.—The city council has plans under way for extensions in its street lighting system.

St. Petersburg, Fla.—The city council has awarded a contract to the Leneave Electric Co. for the installation of a new "white way" lighting system on Central avenue, to cost about $19,500.

NORTH CENTRAL STATES.

Dublin, Ind.—The city council has voted $10,000 in bonds for the purpose of constructing an electric light and power distribution system in the city.

South Bend, Ind.—The Campbell Specialty Wire Works has filed plans for a one-story, 65 by 165 ft. plant, to cost $50,000.

Adrian, Mich.—Considerable electrical equipment will be installed in the plant of the Andrix Nut-Lock Co., which will be completed by the end of September.

Kalamazoo, Mich.—The Kalamazoo Spring & Axle Co. has changed its name to the C. G. Spring Co., with Christian Girl as president. Considerable electrical equipment will be installed to increase the capacity of the plant.

Lansing, Mich.—The Atlas Drop Forge Co. is completing an extensive overhauling of its equipment and is preparing to install an electric heat-treating department.

Chicago, Ill.—The Plamadon Manufacturing Co., 24 North Clinton street, manufacturer of friction clutches and other power equipment, is taking bids for a two-story, 60 by 100 ft. building, at 5301 South Western avenue, to cost $50,000.

Tacoma, Ill.—The Consumers' Central Heating Co. will erect a $200,000 heating and power plant and will install electrical machinery to generate 1600 hp.

Barron, Wis.—The city is constructing a municipal electric light and power plant.

Kaukauna, Wis.—The Kaukauna Machine Co., manufacturer of power hammers and other machinery, is effecting a consolidation of interests with the Moloch Stoker Co., Kaukauna, manufacturer of automatic stoking equipment. The merged companies will expend $100,000 in plant enlargements and new equipment.

Marinette, Wis.—The Oconto Service Co. has purchased the Caldron Falls power site and will erect a power plant, estimated to cost $1,000,-000. T. A. Pamperin, Oconto, Wis., is the president of the company.

Milwaukee, Wis.—The Heil Co., Montana and 26th avenues, is in the market for a 150-250-hp. boiler and for two 10-ton, electrically operated

cranes for installation in an addition to its Milwaukee plant.

West Bend, Wis.—The West Bend Heat & Light Co. will build a power plant at an estimated cost of $80,000. Combustion Engineering Co., 11 Broadway, New York City, is the engineer in charge of the project.

Bemidji, Minn.—The city council is considering specifications for a "white way" system of electric lighting that will include 450 lamps of 400-cp. each.

Stephen, Minn.—A transmission line to furnish Stephen with electric light and power will be built from Crookston.

Dinsdale, Ia.—The Iowa Railway Light Co. will supply the town with electric light and power this fall.

Wahpeton, N. D.—The Richland County Electric Co., recently organized, will construct a transmission line from Wahpeton to Wyndmere.

Carthage, Mo.—The city will extend and improve its electric light and water systems, $100,000 in bonds having been voted for the improvement.

Wentzville, Mo.—E. T. Archer & Co., engineer, 609 New England building, Kansas City, Mo., has prepared plans for the erection of a municipal electric light and power plant at an estimated cost of $30,000. Address W. R. Dalton, city clerk of Wentzville, for further information.

SOUTH CENTRAL STATES.

Blackney, Ky.—The Kentucky & West Virginia Power Co., Whitesburg, Ky., will extend its transmission lines from Blackney to the Elkhorn coal fields.

Jackson, Ky.—The Breathitt County Light & Power Co. has increased its capital stock to $150,000 and will make extensive improvements to its plant.

Louisville, Ky.—The Louisville Gas & Electric Co. is planning extensive improvements in its plant equipment and transmission lines.

Knoxville, Tenn.—The Knoxville Railway & Light Co. is planning extensive improvements to its power plant and transmission systems.

Memphis, Tenn.—The United States Gas & Electric Co. is planning for the rebuilding of its local power plant, recently damaged by fire. The work, including new equipment, is estimated to cost about $150,000.

Birmingham, Ala.—The Alabama Power Co. will build a power plant at Judkin's Riffle, near Wetumpka, on the Coosa river. The plant is estimated to cost $12,000,000.

Danville, Ark.—P. F. Arnold, Hot Springs, Ark., has purchased the Danville Light Co. plant and will make improvements and install new equipment.

Pine Bluff, Ark.—The Arkansas Light & Power Co. will construct a 6600-volt, high-tension transmission line from Pine Bluff to Cottondale. Moreland & Bennett, engineers, Pine Bluff, have prepared the plans.

Beaumont, Tex.—The Beaumont Iron Works has had plans prepared for a number of additions to its plant, including the installation of electric travelling cranes and other electrically operated machinery.

Memphis, Tex.—The Texas Gas & Electric Co. is planning for the rebuilding of its power plant recently damaged by fire. The cost is estimated at $75,000.

Rusk, Tex.—Electric and mechanical equipment will be installed in the ice manufacturing plant to be erected by the Powell Land & Lumber Co. W. H. Shook is the president of the company.

WESTERN STATES.

Albuquerque, N. M.—The Albuquerque Gas & Electric Co. will spend $50,000 in plant improvements and extension of transmission lines.

Mullan, Ida.—The plant of the National Copper Co. was recently destroyed by fire. A new plant will be erected and new machinery installed at once.

Ilwaco, Wash.—The plant of the North Shore Light & Power Co. was completely destroyed by fire recently. The plant will be rebuilt.

Spokane, Wash.—The Washington Water Power Co. will increase the height of its Long Lake dam 4 ft. The additional height will add 1000 hp. to the plant.

Portland, Ore.—The Pacific Telephone Co. will erect a two-story exchange building, at an estimated cost of $132,000.

INCORPORATIONS.

Violet, La.—The Violet Ice & Electric Co. has been incorporated with capital stock of $50,000.

Osage, Wyo.—The Osage Light Co. has been incorporated with capital stock of $12,500 and will build an electric light plant.

Fort Worth, Tex.—The Big Three Welding & Equipment Co. has been incorporated with capital stock of $12,000. C. K. Rickel, B. K. Smith and C. E. Goss are the incorporators.

Taylorville, Ga.—The Taylorville Light & Power Co. has been incorporated with capital stock of $8000 Will M. Dorsey is the principal incorporator.

Superior, Wis.—The Superior Auto Signal Co. has been incorporated with capital stock of $10,000. H. M. Mark and others are the incorporators.

Holland, Tex.—The Farmers' Electric Gin Co. has been incorporated with capital stock of $15,000. The incorporators are C. B. Starke, J. P. Edwards and W. A. McKee.

Detroit, Mich.—The Carr-Weller Co. has been incorporated with capital stock of $20,000, to manufacture electrical equipment. H. A. Carr, 132 Kenilworth avenue, and others are the incorporators.

Bridgeport, Conn.—The Belpedio Bell-A-Phone Co. Capital stock, $500,000. To manufacture telephone equipment and parts. Incorporators: Joseph Cubelli, E. A. Harry and J. P. Erringis.

New York, N. Y.—The A. & S. Electric Co. Capital stock, $20 000. To manufacture electrical equipment and engage in contracting work. Incorporators: L. Zarrel, S. Golde and A. Jenick, 764 Eighth avenue.

Brooklyn, N. Y.—Walter H. Taverner Corp. Capital stock, $60,000. To manufacture electrical machinery and engage in contracting work. Incorporators W. H. Taverner, R. B. Fenner and H. S. Lockwood, 1811 Avenue J.

Wilmington, Del.—The Interstate Electric Co. of Alabama. Capital stock, $350,000. To manufacture electrical machinery. Incorporators M. L. Horty, S. L. Mackey and J. D. Frock, Wilmington.

Ridgeley, W. Va.—The Ridgeley Light & Power Co. Capital stock, $25,000. To operate a local electric light and power system. Incorporators James T. Vandegrift, Howard R. Kight and Elmer E. Briggs.

New York, N. Y.—The Progressive Electric Co., Inc. Capital stock, $50,000. To manufacture electrical equipment of various kinds. Incorporators: Samuel B. Howard, Raymond J. Gorman and Roy Myers, all of New York.

New York, N. Y.—The Petroleum Heat & Power Co. Capital stock, $500,000. To operate a plant at Stamford, Conn., for the manufacture of oil burning, electrical and other appliances. Incorporators: F. M. Forbes, S. Whitaker and R. Adamson, 511 Fifth avenue.

Glen Falls, N. Y.—The Hodgson Electric Appliance Co. Capital stock, $100,000. To manufacture electrical equipment, appliances, etc. Incorporators: E. J. West, W. D. Hodgson, and D. F. Imrie, all of Glen Falls.

Long Island City, N. Y.—The Island City Electric Co. Capital stock, $30,000. To manufacture electric lamps, etc. Incorporators: W. A. Treadwell, W. S. Brown and P. J. Shelley, Brightwaters, L. I.

New York, N. Y.—The Steatite Electric Products Corp. Capital stock, $215,000. To manufacture electric heating and cooking equipment, and other electrical specialties. Incorporators: T. D. Finizio, S. T. Moore and J. N. Strang, Yorktown Heights.

Ridgewood, N. Y.—The Automatic Screw Capping Machine Corp. Capital stock, $200,000. To manufacture electrical appliances of various kinds. Incorporators: Robert Eble, Charles W. G. Baiter and J. V. Ryan, 57 Maple avenue.

Baltimore, Md.—The Utility Battery Sales & Service Corp. Capital stock, $25,000. To manufacture electrical products for automobile service. Incorporators: Robert J. Gill, J. Woodall Greene, and Francis K. Murray.

White Plains, Ky.—The White Plains Light & Power Co. has been incorporated with capital stock of $2500. O. C. Littlepage, F. G. Franklin and W. N. Bailey are the incorporators.

Roanoke, Ill.—The Woodford Service Co. has been incorporated with capital stock of $5000 to generate and sell electrical energy. K. L. Saylor, Roanoke, is the principal incorporator.

Muskogee, Okla.—The Squoyah Hydro-Electric Power Co. has been incorporated with capital stock of $100,000. H. G. House, Muskogee, is the principal incorporator.

Hartford, Conn.—The Rogers Electric Supply Co. has been incorporated with capital stock of $25,000 to manufacture electrical specialties. A. J. Rogers, Arlington, Mass.; Arthur Perkins and F. A. Decor, Hartford, are the incorporators.

FINANCIAL NEWS

Comment on the Financial Outlook in the Electrical Industry, New Securities, Reports of Earnings, Dividends and Utility Stocks

Adirondack Power & Light Corp. Arranges Bond Issue.

The Adirondack Power & Light Corp. has arranged for a bond issue of $5,620,000, the proceeds to be used in part for extensions and improvements, including the erection of a reserve steam-operated electric power plant on the Mohawk River, near Amsterdam, N. Y. The company has been formed through a recent consolidation of the Adirondack Electric Power Corp. and the Mohawk Edison Co., Inc., both operated in the same general territory. The company furnishes light and power service at Schenectady, Amsterdam, Watervliet, Oneida, Saratoga Springs and neighboring sections. It operates hydroelectric plants on the Hudson and Hoosic Rivers, and East Canada Creek, with installed capacity of about 50,000 kw. A number of supplementary steam plants also are operated. J. Ledlie Hees is the president of the company.

Nebraska Power Co.

	1920.	1919
June gross	$ 222,539	$ 180,854
Net after taxes	55,212	59,089
Total income	57,664	84,407
Surplus after charges	22,650	50,254
Twelve months' gross	2,655,935	2,155,887
Net after taxes	900,846	758,975
Total income	970,112	828,251
Surplus after charges	585,334	507,446
Balance after preferred dividends	375,334	297,446

Great Western Power System.

	1920.	1919.
June gross	$ 463,952	$ 400,427
Net after taxes	235,875	225,939
Surplus after interest charges	80,245	97,244
Twelve months' gross	5,696,241	5,084,440
Net after taxes	3,126,147	3,013,764
Surplus after interest charges	1,295,281	1,465,260

United Gas & Electric Corp.

(Subsidiary Operating Co.)

	1920.	1919.
June gross	$ 916,764	$ 775,490
Net after taxes	275,754	276,080
Total income	287,073	277,843
Surplus after charges	127,561	125,046
Twelve months' gross	11,434,766	9,670,958
Net after taxes	3,997,534	3,162,840
Total income	4,046,863	3,193,764
Surplus after charges	2,172,346	1,381,780

Detroit Edison Co.

	1920.	1919.
June gross	$1,607,803	$1,185,753
Net earnings	204,270	322,422
Surplus after charges	11,838	183,363
Six months' gross	10,309,002	7,837,060
Net earnings	2,142,894	2,210,523
Surplus after charges	1,065,950	1,384,782

Portland Railway, Light & Power Co.

	1920.	1919.
May gross	$ 741,360	$ 711,453
Net after taxes	200,255	274,960
Surplus after charges	11,565	82,411
Twelve months' gross	8,746,947	8,186,362
Net after taxes	2,839,168	2,692,461
Surplus after charges	568,752	433,195

Galveston-Houston Electric Co.

	1920.	1919.
June gross earnings	$ 325,157	$ 255,778
Net earnings	99,440	69,721
Surplus after charges	64,148	34,072
Twelve months' gross	3,385,329	2,924,018
Net earnings	914,481	802,491
Surplus after charges	492,496	423,675

Metropolitan Edison Co.

	1920.	1919.
May gross	$ 219,273	$ 159,871
Net after taxes	69,339	63,451

Southwestern Light & Power Co. Offers Bond Issue.

The Southwestern Light & Power Co. is offering, through a banking syndicate, a new issue of $2,000,000 five-year, 8% bond-secured gold notes of the company, due Aug. 1, 1925, at 98 and accrued interest, to yield about 8½%.

Republic Railway & Light Co.

	1920.	1919.
June gross	$ 639,557	$ 474,707
Net after taxes	142,845	118,786
Total income	155,809	146,976
Surplus after charges	30,212	32,527
Twelve months' gross	7,212,941	5,752,757
Net after taxes	1,758,554	1,341,266
Total income	1,919,755	1,590,215
Surplus after charges	499,709	259,932

Connecticut Power Co.

	1920.	1919.
June gross earnings	$ 117,543	$ 96,005
Net earnings	46,684	30,443
Surplus after charges	27,066	11,577
Twelve months' gross	1,380,525	1,163,923
Net earnings	563,803	457,556
Surplus after charges	328,597	231,358

Mississippi River Power Co.

	1920.	1919.
June gross earnings	$ 232,181	$ 192,146
Net earnings	180,861	150,000
Surplus after charges	81,546	48,239
Twelve months' gross	2,492,674	2,232,246
Net earnings	1,946,458	1,742,563
Surplus after charges	821,868	500,612

Northern Texas Electric Co.

	1920.	1919.
June gross earnings	$ 331,492	$ 282,415
Net earnings	120,723	108,528
Surplus after charges	95,859	83,486
Twelve months' gross	3,740,603	2,927,397
Net earnings	1,459,761	1,098,627
Surplus after charges	1,161,401	798,121

Edison Electric Illuminating Co. of Brockton.

	1920.	1919.
June gross	$ 111,006	$ 81,003
Net earnings	39,063	25,804
Surplus after charges	36,698	19,296
Twelve months' gross	1,244,581	980,060
Net earnings	431,708	309,672
Surplus after charges	370,609	230,037

Tampa Electric Co.

	1920.	1919.
June gross earnings	$ 109,836	$ 97,926
Net earnings	37,754	35,411
Surplus after charges	33,509	30,742
Twelve months' gross	1,387,637	1,159,080
Net earnings	545,328	470,387
Surplus after charges	490,872	417,098

Philadelphia Co. and Subisidiary Companies.

	1920.	1919.
June gross	$2,464,133	$1,928,986
Net earnings	945,671	679,061
Six months' gross	17,235,854	14,558,095
Net earnings	8,136,191	6,661,692

Southwestern Power & Light Co. Subsidiaries.

	1920.	1919.
May gross	$ 713,928	$ 468,082
Net earnings	272,032	159,917
Twelve months' gross	7,523,943	5,993,605
Net earnings	3,003,280	2,134,557

Duquesne Light Co. and Subsidiary Companies.

	1920.	1919.
June gross	$1,154,556	$ 930,793
Net after taxes	315,399	324,841
Six months' gross	7,235,297	6,067,319
Net after taxes	2,291,566	2,269,188

Dividends.

The Central Arkansas Railway & Light Co. has declared its regular quarterly dividend of 1¾% on its preferred stock, payable Sept. 1 to stockholders of record Aug. 16.

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Aug. 3.	Bid Aug. 10.
Adirondack Electric Power of Glens Falls, common	6	13	14
Adirondack Electric Power of Glens Falls, preferred	6	72	70
American Gas & Electric of New York, common	10+extra	97	96
American Gas & Electric of New York, preferred	6	34	33
American Light & Traction of New York, common	..	116	111
American Light & Traction of New York, preferred	6	81	80
American Power & Light of New York, common	4	44	40
American Power & Light of New York, preferred	6	65	60
American Public Utilities of Grand Rapids, common	..	4	3
American Public Utilities of Grand Rapids, preferred	7	15	10
American Telephone & Telegraph of New York	..	96	96⅛
American Water Works & Elec. of New York, common	..	2	2
American Water Works & Elec. of New York, particip	7	5	3
American Water Works & Elec. of New York, first preferred	..	35	34
Appalachian Power, common	..	4	1
Appalachian Power, preferred	7	17	15
Cities Service of New York, common	+extra	300	265
Cities Service of New York, preferred	6	65	64
Commonwealth Edison of Chicago	8	100	101
Comm. Power, Railway & Light of Jackson, common	..	17	16
Comm. Power, Railway & Light of Jackson, preferred	6	37	38
Federal Light & Traction of New York, common	..	6	6
Federal Light & Traction of New York, preferred	..	43	40
Northern States Power of Chicago, common	..	27	27
Northern States Power of Chicago, preferred	ex.div.7	75	74
Pacific Gas & Electric of San Francisco, common	..	46	45¼
Public Service of Northern Illinois, Chicago, common	7	65	67
Public Service of Northern Illinois, Chicago, preferred	6	74	83
Standard Gas & Electric of Chicago, common	..	13	11
Standard Gas & Electric of Chicago, preferred	6	35	35
Tennessee Railway, Light & Power of Chattanooga, common	..	1	½
Tennessee Railway, Light & Power of Chattanooga, preferred	6	2	2
United Light & Railways of Grand Rapids, common	4	18	18
United Light & Railways of Grand Rapids, preferred	6	56	55
Western Power of San Francisco, common	..	21	19
Western Union Telegraph of New York	extra	80	82⅝
Industrials—			
Electric Storage Battery of Philadelphia, common	4	98	95
General Electric of Schenectady	8	146	136¾
Westinghouse Electric & Mfg. of Pittsburgh, common	7	52	45½